

METAL FINISHING

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COMING SOON

- Short cut in the calculation of nickel sulfate and nickel chloride in the analysis of Watt's type nickel plating solution.
- An article on anodizing aluminum with sulfamic acid: comparison of sulfuric, oxalic and sulfamic acid processes.
- Alkali cleaners and how their length of service is determined by deterioration due to various chemical and physical changes.
- List of suppliers of metal finishing equipment and supplies and description of their products to be exhibited at the National Metal Congress and Exposition to be held in Philadelphia October 18-24.

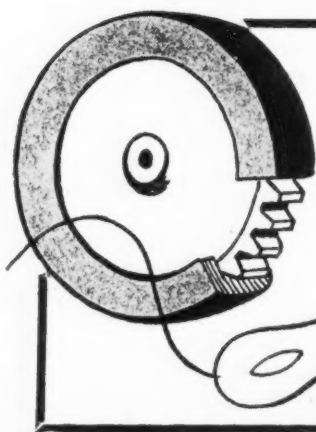
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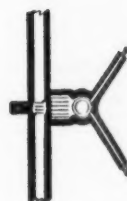


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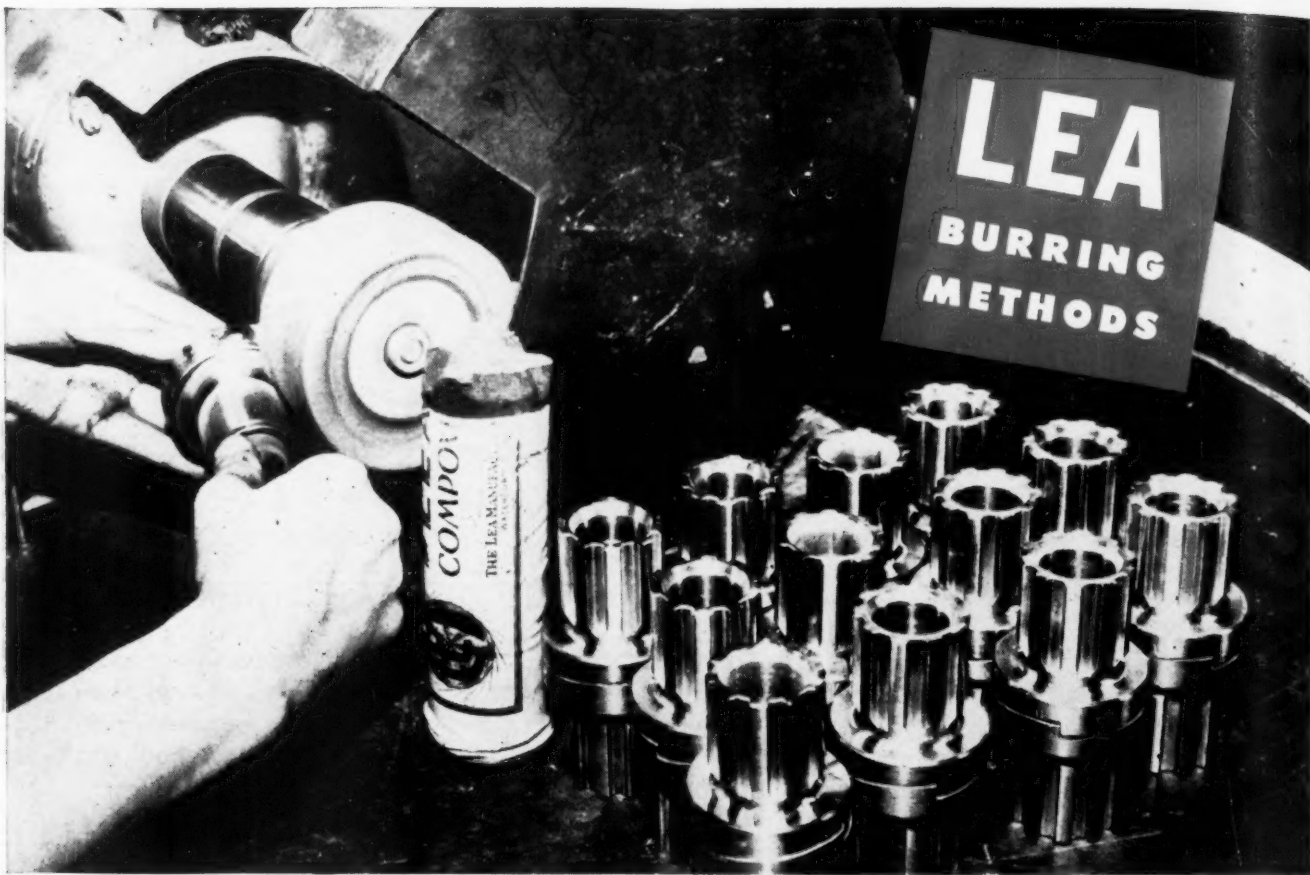


George W. Grupp

News and Views from The Nation's Capitol

- The United States Office of the Quartermaster General, Military Planning Division, Research and Development Laboratories, has released a report on the literature of the performance of magnesium coatings on base metals published during the years 1946-1951 inclusive. This 39 page report may be had for \$1.00.
- The Chemical and Radiological Laboratories of the United States Chemical Corps, Army Chemical Center, Maryland, recently made available an illustrated report on the development of protective coatings for aluminum combat canisters. It describes representative organic coatings used for the protection of metals against the corrosive action of chemical agents.
- The British Information Services, 30 Rockefeller Plaza, New York 20, N.Y., is selling a book on Protection and Electrodeposition of Metals. Part I consists of 20 reports on the protection of metals and Part II consists of 12 reports on the electrodeposition of metals. This is a selection of reports of British research during World War II. The price is \$6.75.
- Technical Services of the Department of Commerce has issued for free distribution Report TAS-97 which deals with "Nickel substitution and Conservation in Electroplating Processes".
- By revoking Order M-97 the NPA removed all restriction on the use of copper and copper base alloys in the manufacture of lighting fixtures.
- The NPA's interpretation of Controlled Material Plan regulation #1 points out that "a person is deemed to be the producer of manufacturer of a Class A product or of a Class B product only if he performs the manufacturing operations which result in the conversion of controlled material or of another Class A product into such Class A product or Class B product".
- NPA Order M-8 was amended to permit private importation of tin for resale without an allocation authorization. Allocations of tin from public sources will now be made on a quarterly basis rather than on a monthly basis.
- Hot-dipped tin plate will remain under strict control for use in domestic food packing.
- Amended Order M-47A and Order M-47B permit the use of copper and aluminum for decorating consumer durable goods. Removal of restrictions for such uses has been made possible because of the increased available supply of those metals.
- Controlled Materials Plan regulation #2 was amended to reduce the amount of permitted inventories of steel until an adequate flow of this metal can be reasonably assured to all segments.
- The Revised NPA Inventory regulation #1 has removed from inventory control such items as antimony and antimony scrap, bismuth, boron, cadmium, calcium, all types of non-ferrous scrap, tin, zinc and silicon.
- Consumer Durable Goods Regulation 161 has been issued by the Office of Price Stabilization for the purpose of making price control simpler for manufacturers. This regulation concerns itself, among other items, with all forms of plated ware.
- The allocations of domestic refined copper to mills and foundries for August were substantially lower than in July.

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Pardon Our Pride

An editor often wonders whether his efforts and the continual striving of his organization to produce a magazine which will satisfy the requirements of the subscribers to the fullest extent is having any results. Once in a while, readers will take the trouble to write and compliment him on what they consider exceptionally good issues but, for the most part, he consoles himself with the negative philosophy that lack of comment or complaint indicates satisfaction. For confirmation, he will check with the circulation department to see if the percentage of subscription renewals is holding up.

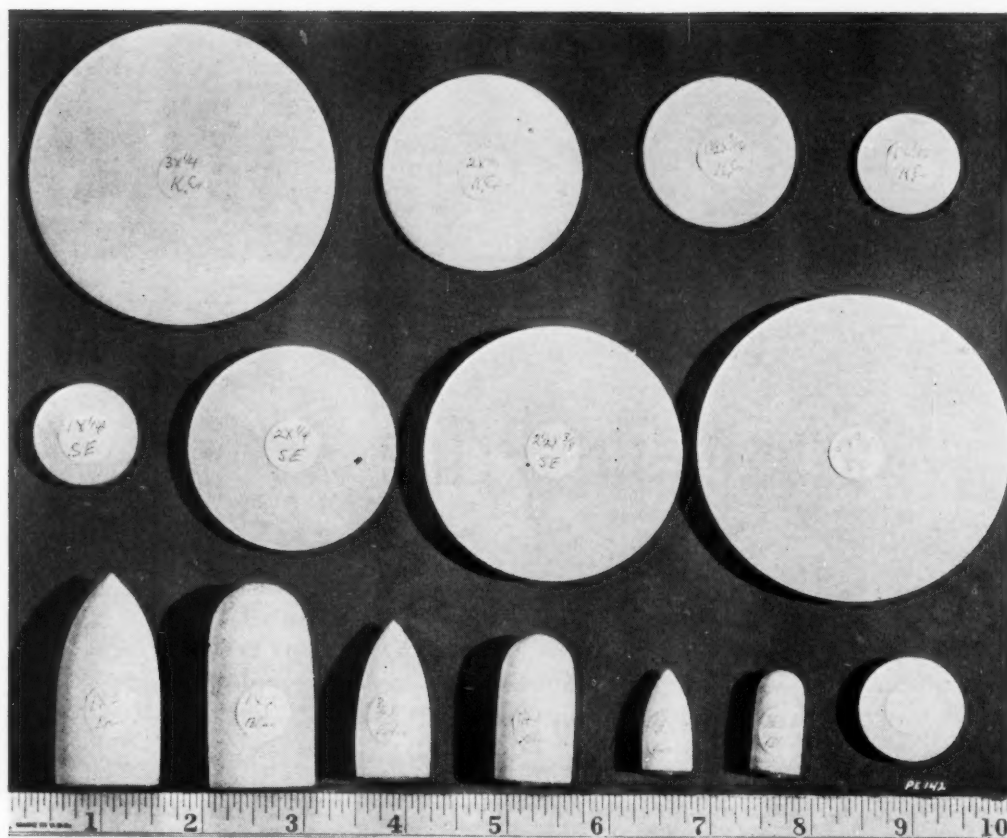
An independent survey was recently made for us by the research department of the Charles L. Rumrill Co. of 103 plants in Chicago, one-third of them job shops and two-thirds manufacturers, with metal finishing departments ranging from a few, up to 600 employees. That 92% of these plants were found to receive METAL FINISHING did not surprise us. And the information that, of the 97 men among the 103 in the survey, who either specified or had an influence in the purchase of materials, equipment and supplies, 90% read METAL FINISHING regularly, was undoubtedly quite stimulating to the advertising department.

Of interest to the editor was the survey finding that, among the magazines serving the industry and received in these plants, METAL FINISHING was *read* by more than two-and-one-half times as many men as our nearest competitor. We had more readers than the closest three magazines *combined*, over 55% more, as a matter of fact, according to the survey. What we are most proud of, however, is that the question: which, among *all* business magazines received by these men, was found most helpful in their work, elicited the answer METAL FINISHING nine times as often as the runner up.

Happy and proud, we have no intention of resting on our laurels. The results of the survey will act as encouragement toward further effort in maintaining and strengthening our position as leader in the field.

NATHANIEL HALL

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Small grinding wheels and bobs turned from sheet felt have many uses in light manufacturing where finishing requirements are exact. Pictured here are wheels from one to three inches diameter and three-sixteenths to three-eighths of an inch in thickness. The bobs shown on the lower line of the photograph are one-half to three inches in length and made blunt or pointed according to the shape of the work surface to be smoothed.

Felt for Metal Finishing and Polishing

By Leon D. Gruberg

FELT, which has had a long history of use for polishing metals and other materials, in the last decade has kept pace with metallurgical advances and is now being increasingly used for precision finishing, grinding, polishing and buffing operations in the metals industries. Rock-hard, coarse, durable felt bobs are being used extensively to finish airplane parts, for the polishing of plates, and for the cleaning and polishing of saw steel, propeller blades, cutlery, chromium plate, tubing, etc. Each of these applications requires that the felt be specially engineered for the intended use. Aside from the important property of elasticity, felt can be coated with abrasive grains designed to do a specific finishing or polishing job. Felt polishing wheels are tailor-made to rigid specifications in up to nine densities and are operated at speeds up to 9,000 surface feet per minute. This article will deal with the kinds of felt used for finishing operations in the metallurgical industries and discuss the specifications and properties of felt used for this purpose.

Metallurgists, in the past, often regarded a highly polished surface with a certain amount of distrust granting to it only the virtue of providing an ornamental effect but contributing little, if anything, of

absolute value. Aviation engineers and metallurgists were among the first to realize that finely finished surfaces might well be a means of revealing surface flaws. A bright finish facilitates both cleaning and inspection, and also reveals any imperfections of the metal at the surface. Just as a pane of glass marked with a glass cutter, or scored by a diamond point, will break along the scratch when gently tapped at a critical point, so superficial scratches on metal itself are indicative of potential weakness. Thus, in aviation as well as in all metallurgical industries, fine grinding and polishing operations are being increasingly resorted to. For its part, the felt industry has developed, standardized and is producing in ever increasing quantities a wide range of felt bobs, wheels, grinding and polishing apparatus to meet the demand for precision polishing materials.

For surface polishing, the job to be done determines the kind of felt to be used. Felt is made in a wide range of densities and thicknesses and varies from gossamer-soft and rock-hard. To polish copper plate for etching, for example, felt sheets are used mounted on large cylinders, while, if the job involves finishing recesses in dies for drawing sheet metal, felt bobs are used. Felt bobs are rotary polishing tools similar to wheels but turned down in a lathe to form special contours

and mounted on flexible shafts. In other applications endless woven felt polishing belts are used — in much the same way as a buffing wheel — to produce a buffed finish on metals. To cite still another example, wheels made of rock-hard compressed felt are used for polishing small diameters of metals prior to chromium plating.

Grinding — Polishing — Buffing

In grinding, polishing and buffing operations felts are used in a number of ways. For polishing relatively soft materials, the hornlike character of the wool fiber itself makes it possible to use the harder felts for polishing, with no additions or supporting agents. For polishing materials of a somewhat harder nature, felt wheels are used in conjunction with other agents. In such applications the felt wheels act as excellent carriers for liquids in which abrasive substances are dispersed. As a matter of fact, about 85 per cent of the felt wheels used for surface polishing are what the industry calls "set-up" wheels. Such wheels are coated with glue and rolled in selected grits to form a more or less permanent abrasive tool, similar in purpose and appearance to the more familiar emery wheel.

Grinding, as any metallurgist can tell you, is a means of removing surface irregularities by the chisel-like grooving or scratching of tiny projecting particles of grit which are partially embedded in the glue or other matrix of the wheel, belt or sheet of sanding material. (In the aluminum industry, for example, scratch finishing of pots and pans is accomplished by rapidly revolving a pad of stainless steel "wool" against the aluminum surface.)

Polishing is commonly understood to be a smoothing operation effected by friction without perceptible abrasion. Buffing, as distinguished from polishing, contributes a shiny surface without appreciable reduction in superficial roughness. Therefore, in many finishing operations, buffing follows polishing, which actually smooths the surface and is often thought of as fine grinding. In buffing operations, the felt wheel is usually coated with a grease compound bearing rouge, tripoli or some other substance. For this purpose the wheel is used without abrasive coating and is charged or conditioned by merely pressing a stick or cake of the compound against the revolving surface. The wheel is ready for use as soon as it has been lightly and evenly coated.

Felt polishing wheels are turned down to various shapes according to the nature of the work to be performed. These wheels are approximately 8 inches in diameter, can be made up to 36 inches in size.

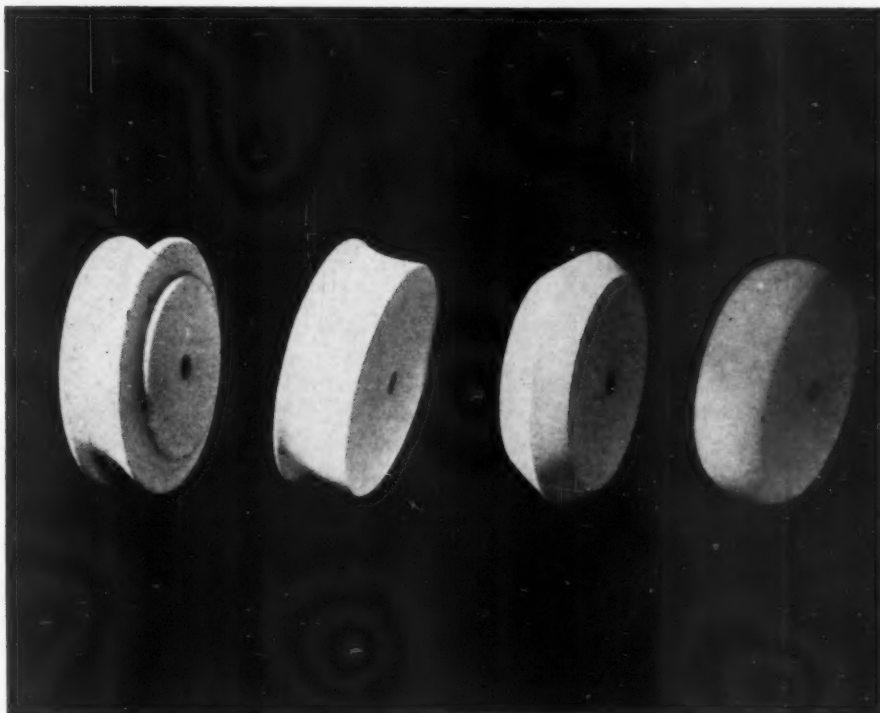
Felt has made important strides in the finishing of ophthalmic lenses, a field in which the art of using felt for this purpose has achieved a good deal of technical development. This development is important for our purposes since it reveals fundamental knowledge of the nature of polishing and may, perhaps, indicate important concepts of value to metallurgists.

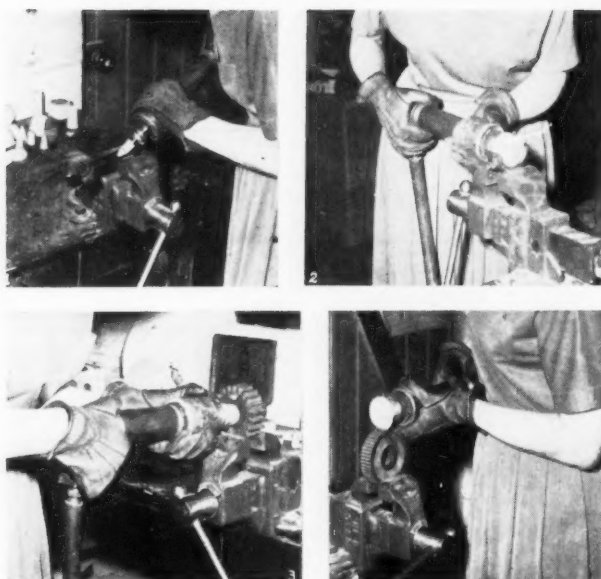
In glass manufacturing, the "scratch wheel" is often resorted to not for polishing but rather to remove minute scratches and surface flaws from polished plate. The scratch wheel, instead of smoothing the surface by abrasive action as in grinding, or through wear as in polishing, apparently develops sufficient frictional heat over the rather restricted area of wheel contact to cause an actual kneading and surface flow of the glass, completely healing scars of minute depth. In lens polishing, on the other hand, there is reason to believe that a physical change is effected involving what is virtually a molecular reconstruction of the glass in a surface layer of decimal depth.

Meanwhile, evidence of change in the character of polished material at the worked surface has been detected in connection with metallographic polishing. Apparently the general subject of polishing awaits systematic research in the physiochemical range. As far as the choice of requirements for grade and density for polishing is concerned, and also the use of such polishing agents as rouge and pumice, selection is based both on the individual experience of industrial users and the standards and specifications established for the various felts which are of immeasurable aid in selecting the right felt for each job.

Standards

Two important products of the felt industry are mechanical roll felts and mechanical sheet felts. For the most part the former are used for washers, dust shields, vibration mountings, grease and oil retainers, packing or padding, etc., and do not concern the purposes of





(1) Finishing outside of a connecting rod with felt cone turned to fit contour of work. (2) Polishing inside of connecting rod bearing cap with small wool felt wheel. (3) Polishing center bore of a precision gear with hard felt bob. (4) Finishing gear teeth with knife edge wool felt wheel.

this paper. The second classification, mechanical sheet felt, has been broken down into rigid standards and specifications thus providing precisely standardized materials for metallurgical finishing and polishing operations. Felt manufacturers, through the *Felt Association*, which is the voice of the industry, have adopted and are sternly adhering to standards (accepted by and promulgated with the assistance of the Society of Automotive Engineers) for mechanical felts.

The standards cover four classes of sheet felts: Fine Spanish, Spanish, Fine Mexican and Coarse Mexican. The first two are finer types while the two latter are coarser fiber varieties. Each type, moreover, is made in five different degrees of density: extra soft, soft, medium, hard, and rock-hard. These densities are distinguished by numbers — 12, 16, 20, 26, and 32, respectively — which serve to designate the weight in pounds of a standard sheet of felt one inch thick.

The sheet felts are applicable to a wide range of technical uses. The extra soft Mexican type, for example, is used to polish aluminum, copper, zinc, and plastics, and for wiping sheet steel during its manufacture. At the other end of the density range, the extra hard Fine Spanish sheets are cut and turned into wheels and bobs for grinding and polishing metals and other materials including dentures, glass tumblers, jewelry, leather, etc.

Standardization of wool felts for mechanical purposes, including the roll felts as well as sheet felts, has had the same far-reaching effect as the standardization of metals and other structural materials. Recently, the felt industry completed a five-year standardization program which included the adoption of physical and chemical specifications. Today, all felt specifications are subject to test methods of the American Society for Testing Materials, designation D-461-49. Standardization is important because it stimulates improved quality control, facilitates procurement in times of national emergency, and performs a service for all manufacturing industries by providing specification materials for better performance and longer life.

The principal distinction between sheet and roll felts, aside from density, is dimensional. Sheet felts, used in the main for polishing operations, are usually produced in sheets one yard square in a standard thickness range of one-quarter inch to three inches. Roll felts are customarily fabricated in the piece, up to 40 yards long by 60 or 72 inches wide and range in thickness from 3/64 inch to one inch.

Apart from size and the fact that the two classes of material occupy complementary ranges of weight, two points of structural differences should be noted. In the manufacture of roll felts the carded fibers are piled in batts having the alternate webbs criss-crossed diagonally to afford transverse strength, whereas in the sheet felts the alternate webbs are oriented through 90 degrees. This not only produces uniform strength but in felt bobs or turned wheels and in special shapes used for grinding operations assures a more uniform radial distribution of the tough fiber ends which do most of the work. Another distinction is that sheet felts are often subjected to pressure to build up density whereas roll felts are dried under tension.

Applications in Metal Finishing

Deep drawing dies, combustion chambers for automotive engines and such diverse products as lipstick holders and darning needles are given their final surface finish with felt bobs or wheels. In short, felt is used by many industries for grinding and polishing a great variety of materials of all degrees of hardness.

A review of some applications will suffice to indicate the importance of felt standards and specifications with respect to specific finishing operations.

In polishing metal cylinders, for example, felt strips are inserted in metal channels and the edge grain of



Wool felt bobs, shaped to suit the desired contour, are often used with flexible shaft drive to form concave surfaces.



Felt wheels are widely used in polishing brass and other metal goods. They have a yielding quality not possessed by hard-bonded abrasive wheels and therefore bring out the luster without removing an excessive amount of metal.

felt is used rather than the surfaces. A Spanish sheet felt is used for this job because it is hard, has plenty of life, and can readily hold grinding or polishing compounds.

For precision polishing of propeller blades an extra hard Mexican sheet felt is used as a base for silicon carbide abrasives.

Cutlery is polished by being placed between rotating felt rollers with fine pumice as a polishing medium. Spanish sheet felt is used because of the need for a hard felt which will deliver a scratch-free finish.

Chromium plated automobile parts, such as grilles, often become contaminated with body paint and require cleaning and polishing. Backcheck felt (this is a mechanical roll rather than sheet felt, SAE Standard F-1, F-2, or F-3, having a density index of 16) is ideal for such jobs because it is an extra firm, lint-free felt providing a scratch-free finish and can be readily cleaned with solvents. Backchecks are also used for wiping metal strips such as brass and steel, and for cleaning metals prior to plating (as in the silver plating of cutlery) where it is imperative that defects and surface contamination be removed before plating. Backchecks, again, because of their dimensional stability, are used to clean tubes. The inside of tubing is often in need of cleaning which can be easily accomplished with punched felt plugs lubricated with wax preparations and blown through the tube by compressed air — does a good job, too.

In the crating industry, green resinous lumber imparts a highly resistant gummy film on all tool surfaces, particularly the facings of circular saws. Felt polishing is used to overcome this condition. After grinding the saw to cut down rough surfaces, wool felt wheels are used to burnish, providing a bright surface that tends to resist the resinous adhesions from the lumber.

The aviation industry uses hundreds of rock-hard, durable felt bobs for finishing engine parts including connecting rods, cams, oil holes and other parts having

irregular contours which a plain grinding wheel could not handle evenly.

Finishing Aluminum

The aluminum industry uses a variety of mechanical finishes, either to alter the appearance or the properties of aluminum surfaces. Thus, the object of the finish may be a particular decorative effect, or to prepare the aluminum surface for other finishes subsequently applied. Among the mechanical methods for finishing aluminum are:

1. Grinding, which is used principally to remove surface variations from aluminum castings. This is done with a rotary grinder set up using a bonded abrasive cup wheel or a canvas wheel faced with suitable abrasives such as aluminum oxide or emery. Abrasive size varies from 25 to 50 grit. The wheel turns at a peripheral speed of approximately 6000 feet per minute. Higher wheel speeds tend to overheat the work while lower speeds may loosen the abrasive from the wheel.

2. Polishing, which is done with wheels or belts having abrasives bonded to them. Aluminum and alloys are polished the same way as other metals, but polishing is accomplished at lower wheel-to-metal pressures. Polishing removes abrasions or marks on the metal resulting from previous operations. Finer abrasives with a more gentle cutting action are employed for aluminum than for steel. The various operations covered under polishing include roughing, greasing or oiling, buffing, and coloring.

A) Roughing is a preliminary finishing operation used to prepare aluminum surfaces for subse-



The above photo shows a wool felt disc being used to impart a high luster to stainless steel plate. It is mounted on a flexible shaft and guided over the steel surface by hand.

quent polishing procedures. Wheels used for roughing are faced with suitable abrasives, 50 to 100 grit. The wheels, made of felt or other material, vary in diameter and thickness. Peripheral speeds are held below 6000 feet per minute to avoid ridging or heating of the comparatively soft metal surface.

- B) Greasing or oiling is a refined roughing procedure. A soft felt wheel faced with 100 to 220 grit aluminum oxide or emery, plus a lubricant (tallow or beeswax) to prevent overheating, is employed. Peripheral speeds of about 6000 feet per minute are used. This is an important and necessary operation in finishing castings and other fabricated work which have been marred by previous operations. Sand castings are invariably given this greasing treatment after being roughed, and die castings are given it as the first polishing operation. The felt wheel has the advantage of uniform density and contains no sewed or cemented seams. Selection of the proper grade of felt must be made since several degrees of hardness are available. For example, a soft, pliable grade is desirable for finishing irregular surfaces.
- C) Buffing provides high luster on aluminum surfaces. It uses a fine abrasive such as tripoli powder mixed with a grease binder which is applied to the face of the wheel which is turned at a peripheral speed of 7000 feet per minute.
- D) Coloring, which does not actually mean a change of color but rather attaining a high gloss or luster on aluminum surfaces. Open muslin buffs are used with soft silica abrasives embedded in greases and peripheral speeds are stepped up to about 8000 feet per minute. A very light work-to-wheel pressure is used.

Other mechanical finishes used for aluminum include scratch brushing, satin finishing, spin finishing, high-lighting, burnishing or tumbling.

Finishing Copper with Felt

The mirror-like finish of copper is obtained by buffing, utilizing very fine and relatively soft abrasives, such as rouge (red ferric oxide), crocus (purple ferric oxide), tripoli or lime, with a wheel of felt or other soft material. The buffing compound is prepared by mixing the abrasive with stearic acid and tallow and forming it into a bar or cake which is pressed against the revolving felt wheel. One may, of course, use liquid polishing and buffing compounds, spraying them on the wheel and thus eliminate the wastage caused by stubs. Liquid preparations, moreover, permit faster and better control of the abrasive and are well suited for automatic machines. Recent improvements in copper finishing are ventilated buffs, which practically eliminate scorching and burning, as well as buffs which do not ravel, with pleats forming pockets to hold the abrasive.

And for Steel and Tin, Too

The steel industry finds various uses for felt in applications where it has proved the ideal material for the job it does.

The Armco Steel Corporation, for example, uses felt



Grinding to cut down rough surfaces and buffing to burnish smooth ones, wool felt wheels serve important purposes in many plants. An especially tough job pictured here is the cleaning of a circular saw used in a crating plant, where green resinous lumber builds a highly resistant gummy film on all tool surfaces.

wheels to polish their No. 7 grade of stainless steel; this grade is commonly called the mirror finish. Similarly, the Crucible Steel Company of America uses felt for buffing their No. 8 finish stainless steel sheet and the United States Steel Corporation uses a Spanish felt belt of 100 per cent pure white wool for buffing stainless steel sheets to a high polish; sheets that have previously been ground by grits of varying fineness.

Felt has a place in tin plating, too. In the tin plate department of the Jones & Laughlin Corporation, a high quality felt is used as a covering for 1 $\frac{3}{4}$ " x 4" x 42" wooden wiper blocks at the entry of the steel strip-tempering mills. A high quality felt is used because objectionable marking of the strip results when any fibers become separated and follow the strip into the mills. There is a considerable wearing action and the quality of material must be such that insures no hazard to the quality of steel strip being rolled.

At the tin mill of the Youngstown Sheet and Tube Company, felt is used in a number of applications, aside from the use of grey felt by all departments for packing and gaskets. Felt is used, in one instance, to cover drag pads on the guide box. The pads are either 2" x 4" or 2" x 2" lumber and exert pressure on the strip to provide tension. Hence, the felt cover minimizes abrasion. On the exit end of the electrolytic line, felt is used on the floor to protect the coated strip from scratching when it rolls from the rewind reel to the area where the lift truck picks it up for transfer.

In Youngstown's cold mill, felt serves another purpose; for distributing oil on cleaning rolls. It is used as wiper, distributing oil at the tension reels of the coil mills and, also, when recoiling tight or dummy iron.

On the backup rolls, on the last stand of the tandem mills, felt wipers are used to prevent dirt or oil flying onto the strip while winding. In all, Youngstown buys about 3,000 pounds of felt annually for these various uses.

The Manufacturing of Bobs and Wheels

All felt polishing wheels and bobs have one thing in common; nothing goes into them but wool and work. The manufacturing process involves hardening and extensive fulling, a mechanical process of kneading wool under controlled conditions of heat, pressure, moisture and lubrication.

Hardening comprises agitating the batts under pressure while in a warm, moist and slightly acidified condition, to induce the individual fibers to become closely entangled, forming a loosely integrated mat of uniform texture. This is followed by fulling which consists in shrinking the hardened blank by persistent tumbling and pounding in a hammer mill. This increases the density to the point of solidification simply by impact, which drives the fibers still closer together. Adhesives are never used in fabricating felt wheels and bobs.

After being fullled, the wheels are straightened, hot pressed to the required thickness and then seasoned in an oven to bone dry conditions. Finally, they are bored and turned to diameter, trued and balanced.

Setting-Up and Care of Wheels

Set-up felt wheels differ from conventional emery or carborundum grinding wheels in a number of important ways. Perhaps the most important difference is that felt wheels are more resilient and thus provide a uniform cutting action through the equalization of pressure. This is made possible by the very nature of the constituent fibers — their natural elasticity. As a result, set-up felt wheels serve a distinct purpose in surface finishing afforded by no other type of wheel.

A felt wheel is "headed" or set-up with a fixed abrasive coating by impregnating the circumference with a glue or resin and then rolling it in the abrasive to bond the grains to the surface.

In some cases "grease wheels" are used. These, too, are set-up wheels in which the action of the abrasive is moderated by the application of grease, tripoli, or other compounds to the grained surface. "Greaseless wheels," which are also in common use, are wheels having a greaseless compound containing the abrasive applied directly to the surface.

The successful use of felt wheels depends first of all upon the selection of wheels of uniform texture and of suitable density, fabricated from the best quality wools. The next most important consideration is the correct choice of abrasives, and finally, the utmost care must be exercised in setting-up. The metal finisher works out the application as a part of his manufacturing technique. The felt industry produces the untreated wheels, bored and turned to size, ready for mounting.

Initially, in setting-up, the wheel should be sized well with thin glue and allowed to dry, followed by finishing with lump pumice to remove surplus sizing and glue. Then the wheel is ready for applying the bonding glue and grains.

The wheel, the glue and the abrasive grains should all be warm; a first run hide glue, in full layer, should be used at 140°F., no higher, and the glue should be applied evenly. Some abrasive grains absorb both water and glue and must be worked thoroughly into the glue and be completely covered by it or else the grain quickly wears away leaving a bare coating of glue which by itself has no polishing properties whatsoever.

In recent years cold cement has increased in use in bonding grains because of its relatively easy application, low cost and quick drying at normal room temperature. Cement, however, should not be used for fine or very fine operations, or with grains finer than No. 180. Conversely, cement rather than glue is recommended for coarse grains or wheels to be used at unusually high speeds.

When a felt wheel fails to run smoothly, or if it wears unevenly, it is rarely if ever the fault of the wheel itself. Such failures may arise from any of the following deficiencies: failure to true the wheel between flanges of equal size or a machine shaft that is not true; loose bearings or flange nuts; vibration of machine or an arbor hole that is too large. Felt wheels may also be distorted by improper storage, wetting, subjecting them to extreme temperature variation, rolling them too hard or too hurriedly in the abrasive grains, effecting an unequal distribution of grain, or using an excessive amount of glue.

Felt wheels of six to 18 inches in diameter, set up with glue, can be used at speeds up to about 9,000 surface feet per minute. If speeds in excess of 9000 fpm are contemplated it is advisable to set up the wheel with cement. Small felt wheels, and particularly felt bobs, under six inches in diameter, are generally used on flexible shafts and at somewhat higher speeds. The use of flexible shafts has a tendency to vibrate or chatter the wheels or bobs and often to wear them down unevenly or even to scuff off the grain coating. It is advisable, therefore, to always use grease when wheels or bobs are used on flexible shafts.

Conclusion

Because of the almost limitless number of applications of felt to the grinding, finishing, cleaning and polishing of metals, it is difficult in an article of this kind to cover all possible problems that may arise. In some cases felt may be the ideal answer to a metallurgical finishing problem and in other cases it may be used improperly or may be used in applications for which it is not suitable at all. Thus readers are invited to bring their inquiries to the attention of the author and every effort will be made to provide full and complete technical assistance.



Material Control in Nickel Chrome Plating

By Robert T. Hood, Assistant Comptroller, Deep Freeze Appliance Division, Division Motor Products Corp.

With the use of certain technical data in the process of nickel chrome plating, it is possible to accurately apportion plating material as productive material rather than through arbitrary distribution of overhead.

NICKEL chrome plating operations have presented numerous problems to cost accountants and paramount among them are those arising from control of the plating materials.

The most important of these problems are:—

1. Necessity of furnishing data regarding plating operations, from the standpoint of costs and efficiency.
2. Budgeting of materials.
3. The furnishing of accurate estimates and standard costs to management with plating materials apportioned accurately as direct material rather than arbitrarily through distribution as overhead.

The following discussion is a possible solution to the problems.

General

Two general methods may be used:—

1. Keeping a running record of work processed and materials used over a long enough period so that average conditions may be approximated.
2. Using control instruments which permit a breakdown of productive material and losses, in conjunction with maintaining a record of materials used.

In any case wherein the cost of plating material is either very large or is a significant or critical part of total cost the second method is recommended and is the one discussed herein.

In either case a standard of reference must be adopted to which other costs are related. Since the largest single expense item is nickel, the cost per pound of nickel deposited may be adopted as a useful standard. However, it may be more convenient to translate this into cost for depositing a given specification on an arbitrary area (which may be described as the effective area) of work. One such method would be the material cost per 1,000 square inches of effective area plated, although it may be preferred to use 100 or 1,000 square feet at the standard.

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The method suggested depends upon the following data:—

1. Nickel anodes added during the period.
2. Scrap nickel anodes withdrawn during the period.
3. Change in metal content from analysis at beginning and end of period.
4. Nickel sulfate and nickel chloride added during period.
5. Nickel deposited during period.
6. Determination of effective area plated from the number of the various parts plated.
7. Average weight of metal deposited on each of the various parts plated.

The general method is to determine from the above data the amount of nickel actually used and the amount of and nature of the losses encountered. The average cost per pound of nickel consumed can then be calculated, including losses, and the cleaning and chrome plating material costs computed on the same basis.

Weight Computations and Discussion

A. Net Nickel Added

Nickel anodes added (1 above)	XXXX
Nickel content of salts added (4 above)	XXXX
Net changes in nickel content (3 above)	XXXX
Total nickel added	XXXX
Less: Scrap nickel withdrawn (2 above)	XXXX
Net nickel added	XXXX

The percentage of nickel in nickel sulfate and nickel chloride (4 above) varies some from the value calculated from the standard formula found in handbooks due to the amount of water of hydration present. The former should have 22.3 percent nickel, and the latter 24.7 percent nickel, but these values should be checked by the laboratory on several different lots of commercial salts.

The nickel content (3 above) per gallon of solution is reported in the analysis.

B. Drag-out and Filtering Loss

Net nickel added (A above)	XXXX
Less: Nickel deposited (5 above)	XXXX
Drag-out and filtering loss	XXXX

Drag-out loss is the solution adhering to the work as it leaves the plating tank. It varies with different pieces

of work and the number of pieces plated, other factors remaining constant. If this loss is approximately the same as in chrome plating, it is between one-half and one gallon per hour of operation. This loss is fairly consistent.

Filtering losses occur when the solution is removed from the plating tank and when changing filters.

The nickel deposited (5 above) is obtained by determining the total number of ampere-hours passing from the generator to the plating tank and dividing the result by 425. The result is the number of pounds of nickel deposited plus an allowance of 2 percent for the efficiency of the nickel-plating solution. The number of ampere hours passing from generator to plating tank can be determined with an instrument similar to an electric meter and called a Sangamo-meter. If there are electrical short-circuits such that all of the ampere-hours are not effective in depositing nickel, the result will be in error.

By keeping the number of anodes in the nickel tank fairly constant, the total weight of nickel will remain almost constant as they are completely replaced by use in a two or three month period. This should give fairly accurate results for drag-out and filtering losses.

If the nickel added (or consumed) is not reasonably close to the nickel deposited, little or no information can be obtained regarding drag-out and filtering losses, unless the anodes are removed from the tank and weighed. This is of questionable value due to cost and inaccuracies due to the water, carbon and anode bags which are also weighed.

A daily record of nickel deposited from Sangamo-meter readings can be used as a basis for replenishing anodes.

C. Loss on Plating Racks

Nickel deposited (5 above) XXXX
Less: Nickel deposited on work (7 above) XXXX

Loss on plating rack XXXX

The amount of nickel plated on the racks is important because of the effect on the work. If too much is plated on racks, customer's specifications may not be met. The percentage of metal plated on racks to total nickel deposited should be reported.

The nickel deposited on work (7 above) is computed as follows:—

All parts must have the average weight of deposit determined by the laboratory or some agency equipped for accurate weighing. The total pieces of each part run during the period are extended by the respective average weight of deposit for each part. The sum of these extensions will be the nickel deposited on work.

All of the above figures used in A, B and C above are expressed in pounds of nickel.

Accumulation of Costs

It has previously been mentioned that a certain weight of metal can be converted into a certain thickness of plating over a determined area. It is most easily accomplished by accumulating all the costs involved and reducing the total to the cost per pound of nickel deposited on the work.

All of the items entering into the cost of operating

the nickel solution must be considered. All the figures in the subsequent forms would be expressed in dollars of cost.

A. Cost of Nickel Added (or Consumed)

Nickel anodes added XXXX
Less: Credit for scrap nickel XXXX
..... XXXX
Nickel sulfate XXXX
Nickel chloride XXXX
Boric acid XXXX
Anode bags and hooks XXXX
Net change in nickel content XXXX

Cost of anodes and salt additions XXXX

As previously discussed in Sections B and C under "Weight Computations" the nickel consumed is used up in three different ways, deposited on the work, deposited on the plating racks, or lost in drag-out and filtering. The weights of nickel for each of the above categories has been previously determined. The above cost should be pro-rated based on relative weight of nickel.

	Pounds	% to Total	Share of Cost
Deposited on work	XXXX	XX	XXXX
Deposited on racks	XXXX	XX	XXXX
Drag-out and filtering loss	XXXX	XXX	XXXXX
Total nickel added	XXXX	XX	XXXX

The cost data on the first two items is carried forward to the final tabulation. Cost of the third item is carried to Section B, immediately following, for inclusion with other drag-out and filtering costs.

B. Drag-out and Filtering Cost

Drag-out loss cost (from previous section) XXXX
Activated carbon XXXX
Filter paper (33") XXXX
Lime XXXX
Nickel carbonate XXXX
Potassium permanganate XXXX

Cost of drag-out and filtering XXXX

This total cost is carried forward to the final tabulation form.

C. Brightener Cost

Brightener XXXX
Non-Pitter XXXX
Brightener Modifier XXXX

Brightener Cost XXXX

It is impossible to obtain data for distributing these costs between (1) drag-out losses (2) filtering losses and (3) nickel deposited, but should a further distribution be desirable the following estimate is made:—

Brightener	Drag-out	Filtering	Deposited
No. 1, RL	10%	30%	10%
Non-Pitter No. 2	5%	75%	20%
No. 3	30%	15%	55%

This total cost is carried forward to the final tabulation form.

D. *Cleaning and Acid Cost (Nickel)*

Cleaner	XXXX
Muriatic acid	XXXX
Sulfuric acid	XXXX

Cleaning and acid cost and (nickel) XXXX

This total cost is carried forward to the final tabulation form.

E. *Copper Strike Cost*

Copper anodes	XXXX
Less: Scrap copper anodes	XXXX

XXXX

Sodium cyanide	XXXX
Other salt additions	XXXX
Carbon	XXXX
Filter paper (18")	XXXX

Copper strike cost XXXX

This total cost is carried forward to the final tabulation form.

F. *Chrome Cleaning Cost*

Sodium cyanide	XXXX
Caustic soda	XXXX
Sodium carbonate	XXXX

Chrome cleaning cost XXXX

This total cost is carried forward to the final tabulation form.

G. *Chrome Plating Solution and Anode Cost*

Chromic acid	XXXX
Sulfuric acid	XXXX
Lead anodes	XXXX
Net changes in chromic acid	XXXX

Chrome plating solution
and anode costs XXXX

Lead anodes have a life of about two years. The net change in chromic acid is determined by a solution analysis.

This total cost is carried forward to the final tabulation form.

Section Tabulation

A. Cost of nickel deposited on work ..	XXXX
A. Cost of nickel deposited on racks ..	XXXX
B. Drag-out and filtering costs	XXXX
C. Brightener Cost	XXXX
D. Cleaning and acid costs	XXXX
E. Copper strike cost	XXXX
Total cost of nickel plating	XXXX
F. Chrome cleaning cost	XXXX
G. Chrome plating solution and anode costs	XXXX
Total cost of chrome plating	XXXX
Total cost of nickel and chrome plating	XXXX

Each of the above costs should be divided by the weight of nickel deposited on the work. The final result is the total material cost per pound of nickel deposited on the work.

Determination and Application of Standard

To effectively use the material cost per pound of nickel deposited in product costs or estimates two methods are available.

One method would be to apply the cost per pound of nickel deposited to each part based on the average weight of deposit applied to that part as determined by the laboratory. This information is necessary, in any event, as previously discussed.

However, for estimating new work, it would be necessary to determine the effective plating area of the part, then convert the area figure into weight of nickel deposited on that area for the required specification.

It may be advantageous as standard practice to determine the effective area of all parts plated and to convert the cost per pound of nickel deposited standard into one applicable to area plated at a given specification. (In most plating set-ups where a variety of minimum specifications are run, it is necessary to plate all parts to the highest minimum required.)

This cost per pound of nickel deposited can be converted, for example, into cost per square foot plated 0.001" thick by multiplying by 21.8.

This method has the advantage of uniform application to both standard product costs and estimated costs for new work.

Whether on a weight or area basis separate figures should be developed for nickel plating and for chrome plating to properly handle special work such as chrome flash operations.

Cost Comparisons and Efficiency Studies

The arrangement of the tabulation of "cost per pound of nickel deposited" on a spread sheet or some other form affording a comparison of unit costs of each phase of the plating operations can be most useful in bringing to light deviations from normal.

Two calculations that can be made on an individual part basis are as follows:—

1. To check % of actual efficiency of nickel utilization.
100 (weight on nickel deposited on the work—1)
(average weight × number of pcs. plated)
2. To check deviation from minimum requirements.
(in this case .001")
100 (weight of nickel deposited on work—1)
(total effective plating ÷ 21.8)

Summary

It is felt that the procedure outlined will furnish most of the answers concerning plate costs, will provide a positive material control for budgeting, and will give the increased accuracy in estimating work and standard costs derived from handling plating materials as productive material rather than through arbitrary distribution of overhead.



Four assembled units, representative of the type of products manufactured at Hamilton Mfg. Corp.

White Brass Plating at Hamilton Mfg. Corp.

By C. C. Weekly, *Plating Supt.*



AT Hamilton Manufacturing Corporation, Columbus, Indiana, manufacturers of the "Cosco" line of metal furniture, we, with the rest of the decorative plating industry, were faced by the governmental orders curtailing, and finally eliminating the use of nickel on our products. For several months we investigated various substitute finishes that came to our attention, installing pilot setups, and checking different methods for the purpose of finding a finish that would fit into our production picture, meet our standards of appearance and corrosion resistance, and also be practical from a cost standpoint.

During the latter half of 1951 our attention was directed to a proprietary copper-zinc alloy plating process so, as with other processes, we investigated the possibilities of this white brass plating. On the basis of this initial investigation, we decided to install an experimental 250 gallon solution. Results were encouraging enough for us to install 2700 gallons of white brass solution in a semi-automatic plating machine. After a short period of operation in this setup, it was decided to convert our complete plating operations to this process. We are presently operating 11,000 gallons of white brass solution in four semi-automatic plating machines, and have accumulated in excess of fifteen million ampere-hours of plating time in eight months of operation.

Since many in the plating industry are now in the

same position that we at Hamilton Manufacturing Corporation were in a few months ago, that is, at the point where they must convert from a nickel plating installation to some other process, perhaps an account of some of our experiences and findings regarding white brass alloy plating will be helpful to the industry at this time.

Let us look at a few points to consider in evaluating any plating process, and discuss these points from the viewpoint of our experience with alloy plating.

Appearance is very acceptable, being equal to the finish obtained in the bygone days of plentiful nickel. It is difficult, or impossible for even an experienced plater to distinguish a difference by visual inspection.

Ductility is excellent. Plated parts can be bent, hammered, or distorted by other means, such as forming after plating, without cracking or peeling of the plate.

Corrosion resistance is good. Plated articles show no red rust until after 70-80 hours exposure to the standard salt spray, and show no white corrosion products until after 20-30 hours. This white corrosion can be wiped off even after 50-60 hours exposure, leaving a bright plated surface. A few rust spots, and some white corrosion will show after 100 hours in a humidity cabinet. For indoor uses to which our products are subjected, we are satisfied that we have an attractive, durable, corrosion resistant finish that will meet our specifications and the demands of our customers.

Cost is well within the range where it is practical for us to operate a plating department. It is very comparable to that of our previous operations.

We find control to be a more critical factor in this process than in nickel plating. Operations are carried



View of two of the semi-automatic plating machines containing white brass solution.

on through a two shift, 16 hour period, and it is found desirable to have laboratory personnel present during the entire time of operation. At least one complete analysis is made daily, and more on some occasions, if indicated by plating conditions. We consider a Hull cell a definite necessity, plating periodic panels during the entire time the department is operating. No additions of materials are made to the plating tanks without first checking the effects of these additions in the cell. By using the Hull cell in this manner, changing bath conditions can be detected and corrected before plating difficulty is encountered.

The only changes in equipment made necessary by this conversion were the addition of cooling and solution agitation systems to the Koroseal lined tanks that were converted to white brass. Cleaning, rinsing, and chromium plating cycles were not changed. Cooling of solution is obtained by pumping through a water jacket, or heat exchanger, through which well water at a temperature of 58°F. is passed. This water is then carried to the various rinse tanks in the plating department. The plating solution is pumped through the heat exchanger, and is returned to the plating tank by means of perforated pipes resting on the floor of, and extending the full length of the plating tank. As the solution is returned under pressure, rather violent agitation is achieved by this method.

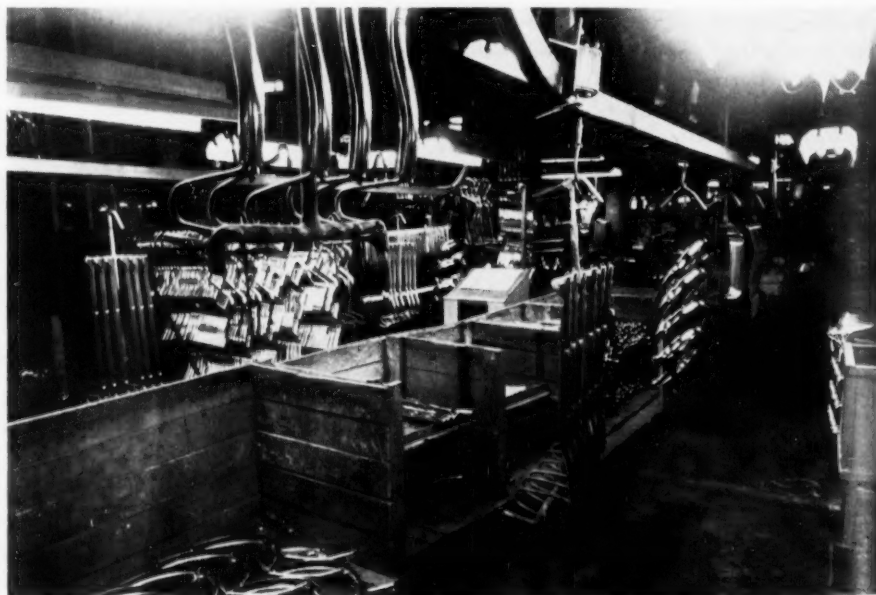
Commenting in general on methods of operation, and on knowledge acquired during the period this process has been in operation, we

solution which might remain on the surface of the work can cause undesirable streaking conditions which will show after parts are chromium plated.

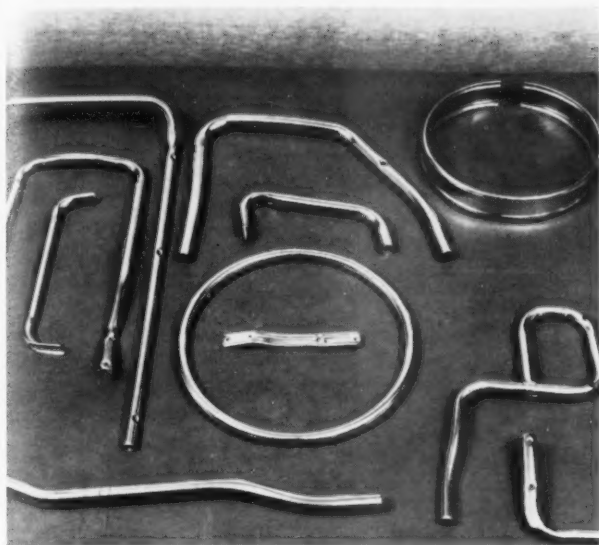
Close attention must be paid to cleaning of plating tanks when converting from other types of plating. Traces of the previous solution remaining in the tank can cause difficulty by contaminating the white brass solution.

Filtration was an unknown factor when this type of plating was installed. After experimenting with various filtering cycles and filtering media, it was found that, when using a 1200 gallon per hour filter, employing a filter aid pack, we need to filter 50% of each days time. Lack of filtration can cause a drop in solution conductivity. Carbon treatment has not been found to be necessary during this period of operation.

At the present time zinc anodes alone are used. In the original installation a combination of zinc and stainless steel anodes was used, but some undesirable current conditions were encountered due to anode polarization, so the stainless steel anodes were removed. A carbon-zinc anode combination has been used successfully in some installations, and a copper-zinc alloy anode is now



View of the inspection and unloading line.



A few parts showing the type of articles plated at Hamilton Mfg. Corp.

on the market for use in a white brass plating bath. Zinc content is controlled in our solution by the addition or removal of zinc anodes, as indicated by analysis, but it is found that very little adjustment is necessary after the proper anode area has been determined. Copper concentration is maintained by the addition of copper cyanide.

This bath is complex in nature, with many variables to take into consideration. Some factors that must be controlled are copper to zinc ratio, total metal to total cyanide ratio, and indications are that sodium hydroxide and brightener concentrations must vary if metal and cyanide content fluctuates. The operating range on total metal is rather wide, in fact, can vary as much as 1.0 oz./gal. provided the other constituents of the bath are varied proportionally. The copper to zinc ratio can vary as much as 10%, but we find it advisable to set a standard analysis, and adhere closely to it. The bath operates as a pH of 12.3 to 13.3. We find it better to make additions of sodium hydroxide on the basis of pH, rather than that of hydroxide analysis, even though

this analysis is made daily.

Brightener control is by means of the Hull cell, and should be watched closely, as an excess can cause difficulty in subsequent chromium plating. It is also a vital factor in the cost of operation. During the period of time this bath has been in operation changes were made in brighteners, which resulted in a more easily controlled bath.

Rejects are by no means a major problem in our plant but, as with any plating department, we do have a few. Salvage operations are very simple and rapid. Stripping of rejected parts is accomplished by means of muriatic acid to remove the chromium and zinc, followed by a very short immersion in a chromic-sulfuric acid bath to remove the copper. The steel surface is not damaged by this process.

As we approached this method of plating a few months ago, much was unknown about the operation of white brass on a production basis, and no doubt much more will be learned in the future. The first period of operation entailed a great deal of work and time spent in close concentration on details, the keeping of accurate and complete records of operating conditions, and in experimental work. The plating foremen and laboratory personnel all contributed to making this process a success in our plant. Management in its entirety, realizing the existing situation, gave their unqualified support to this program, support that was an invaluable aid to the progress made. The supplier of the plating process worked very closely with our organization, making available laboratory facilities and personnel if needed. Modification of materials and processes were made that were a definite improvement. Through the cooperation of all concerned in this operation, white brass plating at Hamilton Manufacturing Corporation has settled into a smoothly running, routine operation, producing a very acceptable product. To any who, of necessity, must change from their present process, I can say, in view of what has been learned in the last few months, that it will be well worth the time spent to investigate white brass alloy plating.

Russians Claim Discovery of New Electroplating Method Using Alternating Current

OCCASIONAL references in the Soviet press during the past few years have hinted that Russian scientists were working on the problem of substituting alternating for direct current in electrolytic processes, but no information was vouchsafed on what progress had been made in the new direction. Now comes the first claim, in "Pravda," the official organ of the Soviet Communist Party, that the problem has been solved by an inventor named A. G. Presnyakov.

The "Pravda" article is coupled with an outspoken attack on the Soviet Ministry of Engineering and Instrument Making, which is accused of having wilfully neglected Presnyakov's invention. It is claimed that considerable economies on capital outlay could have been derived from the application of the invention in industry. The Ministry's failure to exploit the invention is therefore alleged to have resulted in losses to

the national economy.

According to "Pravda," Presnyakov has evolved several methods for the use of alternating current in electroplating. One of these has been adopted, apparently on an experimental basis, by a Moscow motor repair works where "the world's first galvanic nickel-plating tank working on alternating current" is now claimed to be in action. The tank is filled with "a shining, greenish solution" in which the copper articles destined for nickel-plating are immersed, to emerge "shortly" afterwards "glistening with silvery nickel." The paper does not disclose how brief or protracted "shortly" is.

The article explains that under the old method electroplating shops were composed of two departments: the first, which held the tanks, with switching apparatus

(Concluded on page 80)

The Production of Cast Nickel Anodes

By Edmund R. Thews

ONE of the chief factors determining the success of the electrolytic nickel plating process is the composition, the physical state and the treatment of the anodes. This applies more or less to practically all electrolytic anodes, of course, but it is a matter of experience to the modern anode producer that the manufacture and employment of nickel anodes involves a number of viewpoints which have been disregarded by many throughout the entire period of development of electrolytic nickel plating processes.

Two of the most important of these viewpoints concern the degree of purity of the anode material. While on one side most of the nickel electrolytes are very sensitive towards impurities, pure nickel anodes exhibit a pronounced tendency towards passivity, i.e. to decreased anodic solubility. The higher the degree of purity of nickel anodes the lower their degree of anode solubility under ordinary nickel plating conditions, inducing a corresponding reduction of the efficiency of the electrolyte (unless counteracted by a number of measures usually exerting an unfavorable influence in other directions) and a considerable increase, beyond the permissible limit, in the sulphuric acid content of the electrolytes usually employed.

It is for this reason that the purer types of nickel anodes, developed with the progressive introduction of commercially pure grades of nickel met with considerable opposition on the part of many platers. Twenty-five years ago, when the purity of anode nickel was increased from 90-92% to 95-97%, numerous platers in the USA as well as in Europe required years to be convinced of the advantages of this development and to adapt their plants to the higher quality of these anodes. Similar difficulties were encountered with the introduction of the 99% quality nickel anodes which are almost exclusively employed to-day, while very few nickel platers have become convinced of the usefulness of the 99.5% grades introduced a few years ago and which naturally tend to exhibit a much greater tendency toward passivity under ordinary electrolytic operating conditions.

In judging, or evaluating, the individual impurities of anode nickel, a number of important and partly opposing factors, such as their action in the electrolyte, their tendency to concentrate in the electrolyte and to form sludge settling on the bottom of the tanks or contaminating the electrolyte or the cathode faces, and their influence on the general technical and galvanic properties must be considered.

Impurities Present

The most important impurities are chromium, arsenic, zinc and iron, which exert their damaging effect even if present in very small percentages. Chromic acid,

for instance, induces pronounced deterioration of the throwing power, cathode efficiency and the general physical properties of nickel deposits. Arsenic causes the formation of gray, streaked, brittle and partly porous deposits. The presence of zinc in nickel coatings leads to the formation of dark, streaked and easily exfoliating deposits, while the action of tin is similar in its general effects to that of zinc.

It must be remembered, however, that the bulk of these impurities in nickel solutions does not originate in the anodes — as long as these correspond to specifications — but in the nickel salts added to the electrolytes, while a few of them, such as tin, are introduced by the cathodes themselves (in the nickel plating of white metal alloys, bronzes, etc.). Zinc is the only element usually introduced by anode nickel.

Contamination of the electrolyte is more frequently induced through the cathode material, as is realized by most platers. This applies to copper, which can be dissolved from deeply profiled copper cathodes (which are but slowly nickel plated in their deepest recesses); lead, which can be dissolved from white metals to be nickel plated; and zinc, which is usually dissolved from zinc or diecast zinc alloys. The same applies to iron, which dissolves until it is nickel plated so that, in deeply recessed articles, comparatively large amounts of iron may be dissolved before the entire surface is covered with a nickel film, preventing further solution of iron.

The common commercial brands of anode nickel also contain varying percentages of copper, iron, manganese, magnesium, carbon and silicon. Copper must not be present in amounts larger than 0.020-0.025%, since the presence of appreciable quantities of this element in nickel solutions induces the formation of dark, unattractive deposits and reduces the corrosion resistance of nickel coatings considerably.

The iron content of anode nickel should not exceed 0.05% in order to avoid the unfavorable effects of this impurity on the formation of sludge in the electrolyte. If it is cathodically precipitated as a basic salt, it also leads to porous nickel coatings. Manganese and zinc contents must not exceed 0.01%, while magnesium should never be present in amounts larger than 0.05%, the nickel content of standard anode nickel being 99%.

It should be remembered in this connection that if magnesium is present in any appreciable amount it solidifies between the nickel crystals in such a way that these crystals are actually embedded in magnesium. Since the latter is more easily and rapidly dissolved under normal anodic conditions, the crystals are gradually dissolved out of their metallic base, dropping into the sludge. A by-product of this reaction is nickel peroxide, which increases the amount of sludge, and nickel hydroxide.

It is a peculiar fact that a number of the common impurities present in anode nickel exhibit pronounced technical advantages, so that they are intentionally added in some of the special, or proprietary, anodes produced. This applies in the first place to graphite and silicon. If the nickel anodes contain graphite in sufficient quantities the tendency is to form an insoluble soft slime or gel in connection with solutions containing chlorides. These slimes produce a comparatively soft and dense surface layer on the anodes which retains the nickel crystals loosened by irregular anode corrosion until they have been dissolved, preventing excessive loss of metallic nickel in the slimes and avoiding the formation of rough nickel coatings due to the deposition of small nickel crystals floating through the solution. This property of graphite has been made use of in the production of "carbonized" nickel anodes containing 0.08% to 0.15% carbon in rolled anodes and 0.08% to 0.30% in cast anodes, while the silicon contents range from 0.05% to 0.08% in rolled anodes and from 0.10% to 0.35% in cast anodes.

The action of silicon closely resembles that of the graphite contents of anode nickel. Left behind by the electrolytically dissolved anode nickel it forms a dense layer of silica gel on the anodes which, like graphite, does not prevent the passage of the current and the nickel ions but retains the nickel crystals loosened by the non-uniform solution of the cast nickel structure. A considerable advantage of these silica-gel layers is that after reaching a certain thickness and consistency they drop away from the anodes after the nickel crystals retained have been dissolved by electrolytic action while, if these anode coatings contain graphite alone, they exhibit a comparatively high degree of adhesion and require mechanical removal at regular intervals in order to avoid partial interruption of the electric current. It is for this reason that the "carbonized" nickel anodes always contain a suitable percentage of silicon to aid and complete the action of the graphite and to induce the removal of the surface layer at regular intervals.

Pro and Con of Cast Anodes

Nickel anodes are employed in form of cast, rolled, hammered, sintered and electrolytically produced form. It is the purpose of this article to describe the production of cast anodes in such a manner as to avoid at least a few of the disadvantages frequently characterizing this type of nickel anode in comparison with the other anodes developed for this purpose. The most important advantage of cast nickel anodes is their high rate of solubility. The most serious disadvantage of cast anodes, on the other hand, is the gradual disintegration of the anodes by the electrolytic action leading to 1) the production of considerable amounts of oxide slimes, 2) the isolation of a large percentage of nickel crystals which are set free by non-uniform solution of the anode nickel and drop down to the bottom where they mix with the anode sludge. Addition of chlorides to the electrolyte counteracts excessive formation of nickel superoxide but does not prevent the loss of undissolved nickel crystals.

The formation of anode sludge is not merely a question of loss of nickel and nickel compounds but may affect the nickel deposit as well. It is a matter of expe-

rience that, if an anode produces more than 0.04% of sludge, it tends to induce rough deposits. Another well-known fact is that cast nickel anodes produce about 2 or 3 times as much sludge as rolled anodes and that the sludge of cast anodes is lighter and more difficultly settling than that of rolled anodes. It is clear, therefore, that cast anodes not only produce more sludge than rolled anodes but that their sludge production is more dangerous to the surface properties of the nickel deposit. Attention is called to the fact, however, that the formation of sludge is also dependent upon a number of other factors such as the pH values and that higher pH values tend to yield much larger quantities of sludge than comparatively low pH values.

The chief reasons for the higher degree of sludge formation in cast anodes may be found in faulty melting and pouring treatments and the presence of metallic impurities, oxides and carbon. The nickel crystals lie imbedded in some of the metallic impurities such as magnesium which are more easily dissolved. Under the electrolytic conditions involved, the nickel crystals are gradually dissolved out of their matrix, resulting in the formation of metallic crystals in the sludge and of black nickel peroxide. Wherever the anodes are uniformly dissolved, sludge formation is reduced to a minimum. Apart from the large metal crystals which drop down into the anode sludge, very small crystals are carried over to the cathode where they contaminate the deposit, inducing rough and easily corroding nickel coatings.

The disadvantages characteristic of cast nickel anodes can be considerably reduced by rolling, hammering or pressing. The fact remains, however, that in spite of the improvements effected by the addition of silicon and graphite to special anodes and by the mechanical finishing treatments of the cast anodes, they have lost much of their previous ground against the rolled types of nickel anodes. This fact is not due entirely to disadvantages irrevocably connected with cast nickel anodes but, to a considerable extent, to faulty casting practices and to unsuitable treatment of the anodes previous to or after their immersion in the solution. It is a matter of experience that if alloying, melting and casting of the anode nickel are carried out with due care and with a proper view to the requirement involved, cast nickel anodes are bound to yield very satisfactory results, especially if they are subjected to suitable mechanical finishing treatments such as hammering or rolling.

It is sometimes stated that nickel anodes should be cast in sand molds exclusively and that they should be cooled down as slowly as possible if maximum results are to be achieved. This opinion is erroneous. It is true that the practice of sand-casting nickel anodes has progressed much further than chilled anode casting in most countries, but the developments of the last ten years have wrought numerous and important changes in this direction, and it is possible today to produce high grade chill-cast nickel anodes possessing a uniform and fine-grained structure.

There can be no doubt that if chill-cast nickel anodes are produced free from characteristic faults and, if they are subjected to a suitable finishing treatment, they exhibit much better galvanic properties than plain sand

castings, although hammering and rolling, followed by an annealing treatment at a temperature of 1475-1500°F. yields very satisfactory results.

Attention must also be paid to the fact that the various advantages and disadvantages named for the different types of anodes frequently do not represent absolute values, since the behaviour of these anodes is governed by a number of more or less important operating factors such as the composition of the solutions, their general electrolytic values, temperatures, etc. If an electrolyte and the operating conditions are strictly adapted to, say, rolled anodes, results are bound to be disappointing if these anodes are suddenly replaced with cast anodes without effecting suitable corrections of electrolytic conditions to adapt the nickel plating process to the characteristic properties of these anodes. The same deductions apply if cast anodes are replaced with rolled anodes under similar circumstances.

In order to attain maximum results with sand-cast nickel anodes the following requirements must be fulfilled:

1. The nickel must be as pure as possible, and the melting and casting process must be carried out so as to obtain dense castings free from gas contents of any kind.
2. Cooling of the castings must be effected so as to obtain a uniform and fine-grained structure.
3. The surface of the castings must be absolutely clean and free from casting skin.

Gas Absorption

The affinity of fused nickel for gases and its absorption capacity, especially for carbon monoxide and dioxide, hydrogen, nitrogen and sulphur dioxide plays an important part in the casting of nickel anodes. Of the impurities mentioned only sulphur dioxide must be considered a straight impurity although quantitatively it takes a very important position only in contrast to the carbon compounds. Studying the absorption capacity of nickel for gases of the kinds commonly encountered, Hessenbruch fused pure nickel in various common gases and produced nickel cubes weighing 100 grams each. The purity of the nickel was 99%. These cubes were then subjected to gas extraction at a temperature of about 2750°F. and it was found that 100 grams of nickel contained almost 500 cc. of gas. An analysis of the gas thus liberated yielded the following:

Carbon monoxide	90%
Carbon dioxide	2.3%
Hydrogen	3.5%
Nitrogen	4.2%

Further experiments indicated that granulated nickel contained even higher percentages of gas; in one instance of this type 100 grams of granulated nickel yielded 800 c.c. of gas containing 93% carbon monoxide and 4.5% hydrogen. Electrolytically produced nickel contains only 8 cc. gas/100 g. nickel.

In studying the influence of other constituents of nickel castings on their technological properties it must be kept in mind that the requirements are entirely different from those prevailing in the case of other nickel products. Specifications with regard to the chief mechanical properties such as tensile strength, elongation, hardness and ductility exhibit different maxima

and minima since nickel anodes are but little stressed in this direction.

This applies, for instance, to the maximum percentages of oxygen present in the nickel which, until about 20 years ago, was made responsible for the brittleness of nickel castings. It has been found in the meantime that the high degree of brittleness of some grades of nickel is not due to their oxide contents but to the relatively high percentages of sulphur contained. Nevertheless, oxide contents are generally condemned, while in cast nickel anodes a small, well distributed and finely divided percentage of nickel oxide really represents an advantage since it tends to counteract the tendency of cast nickel anodes towards polarization and non-uniform solution. This point will be considered at some more detail below.

Use of Scrap Anodes

The charging and melting treatment of anode nickel does not offer any unusual difficulties beyond those commonly encountered in the manufacture of high grade nickel castings generally. Pure virgin nickel and pure remelted anode scrap alone must be used for this purpose. The use of anode scrap in these charges still represents a debated question, but there can be no doubt that if the scrap is properly cleaned and prepared previous to its addition to the virgin charges, no disadvantages are introduced.

The use of anode scrap requires the following precautionary measures. The scrap must first be mechanically cleaned by removing all the oxides and non-metallic residues from the clean core by means of wire brushes or, most satisfactorily, by sandblasting. Even this apparently pure material must not be charged directly into the virgin nickel melt but should be melted separately and subjected to the ordinary refining treatment common with nickel melts. The remelted material is cast into block molds and is then added to the virgin charges in suitable percentages. The question as to the maximum amounts of secondary (remelted anode) material added to these charges appears immaterial within a certain range of compositions. It is sometimes claimed that anode nickel charges should not contain more than 30% of anode scrap, but this assertion refers to straight and untreated scrap only. If the anode scrap has been remelted and refined, there really appears to be no strict limit; the author has produced nickel anodes with charges containing 50, 60 and 75% of refined, remelted material without the slightest complaint from the nickel platers. In discussing the pros and cons of the addition of anode scrap and of the possible maxima in question, it is always necessary, therefore, to consider the state in which this scrap is added. Crude anode scrap should never be added at all. Mechanically clean scrap can be added in percentages of up to 25-30% while refined remelted material (previously cleaned mechanically, of course) can be charged in amounts of up to 75% without taking chances.

The author's method of remelting clean anode scrap is as follows:

The scrap is charged into a preheated crucible and brought up to a temperature of 2900°F. The metallic surface is then cleaned, 0.3-0.5% of nickel oxide added and the metal permitted to soak with cover removed for about one hour. A flux layer consisting of mixtures

of glass scrap, sea-salt, fluorspar, etc. or mixtures of equal parts anhydrous sodium and potassium carbonate is then added. After another 10 minutes of quiet standing, 0.15-0.20% of magnesium is stirred into the melt which, after about 5 minutes, is subjected to the casting test.

The test sample of the nickel produced is poured into a mold 1" wide, 6" long and 1/2" deep, the cooled bar is fastened in a vise and hammered over to form an angle of 90 degrees, the amount of bending resistance encountered indicating the degree of purity of the nickel. If the metal appears to be too hard, or even brittle, another magnesium addition of about 0.05% is stirred into the metal and the bending test repeated, continuing until the nickel is sufficiently flexible to indicate a sufficiently high degree of purity. It is easy enough to obtain the "feel" if a few tests are carried out with nickel known to be pure.

Melting and Deoxidizing

The usual types of melting furnaces for anode nickel are the various types of crucible furnaces or electric furnaces. The reverberatory furnaces formerly employed for the melting of relatively large quantities of anode nickel have now been replaced almost completely by large-type electric furnaces or by oil-fired crucibleless furnaces, although this latter type of melting furnace shares the characteristic disadvantage of the reverberatory type of furnace, the direct contact with the flame, or the gaseous products of combustion which, in view of the extraordinary affinity of nickel for gases, represents a rather detrimental factor. It is true that by maintaining a neutral or slightly oxidizing atmosphere the chief danger, the absorption of carbon monoxide and hydrogen, is reduced to a minimum, but the disadvantage compared with the electric and crucible type of furnaces remains. Graphite crucibles cannot be used in their original condition on account of the high degree of affinity of nickel for carbon. It is customary, therefore, to use refractory clay crucibles for this purpose although graphite crucibles with a clay lining about 1/2" thick also yields satisfactory results. The author has also used graphite crucibles in which the surface graphite on the inside was burned away, the amount of carbon absorbed by the nickel from this source being practically insignificant indeed. If crucibles with a clay lining are used for this purpose these must be carefully preheated (the lining burned in) previous to usage.

Gas or oil are the proper fuels for nickel melting, the high temperatures and uninterrupted melting periods involved excluding any of the solid fuels for this purpose. There is little difference between these two types of fuels although, on account of the greater regulating capacity and the cleaner operation, gas firing is usually preferred wherever this is technically or economically possible. It is clear, of course, that all depends on the type of fuel available and on the combustion plant (pipe lines, burners, etc.) provided. In a Scandinavian country the author was forced in the cold winter 1939-1940 to replace oil fuel with city gas because of the continuous difficulties with thickening oil. The melting point of nickel is 2650°F. The pouring temperature is 3000 to 3100°F., depending on size and shape of the anodes produced.

In melting down the anode nickel, all possible precautions should be observed to reduce the absorption of gases to a minimum. It is for this reason that the metal should be melted down as rapidly as possible, one of the usual means of attaining this end being the preheating of the furnaces and crucibles as well as of the nickel to be charged. A fair preheating temperature for the crucibles is 1300-1450°F., while electric furnaces are preheated right up to the melting point of nickel before charging the metal.

The nickel may be preheated to a charging temperature of 1000 to 1300°F. in an annealing furnace located near the melting plant, the main advantages of this process being:

1. the rapid fusion of the nickel charge
2. an important reduction of the thermal stress imposed on the crucibles, ensuring a longer life of the crucibles.

This latter factor is of considerable importance in view of the comparatively high temperatures to which nickel melting crucibles are exposed.

Charging of the nickel is best carried out by adding a few of the larger pieces if differently sized slabs are available. If these are melted down quickly, a bath of metal is formed in which the other nickel pieces submerge while melting down quickly. If the primary bath is well covered with a flux, this method of charging reduces the absorption of gases to a minimum. If block nickel of equal size is charged exclusively, it is advisable to fill up the crucible with the preheated nickel at once, to throw in a small amount of flux mixture and to cover the crucible with a well-fitting lid until the entire charge has liquified.

The crucible is filled with nickel up to about 5 or 6 inches below the rim. After heating the melt to a temperature of about 3100°F. it is deoxidized by means of manganese or magnesium, strong stirring being one of the most important factors for successful deoxidation with these agents. Best results are obtained if the pieces of deoxidizing metals are tied to a steel rod by means of steel wire.

Of the two deoxidizing agents mentioned magnesium is usually considered the most advantageous, although the chief differences between these two metals are of importance only where mechanical properties play a deciding part. In the case of nickel anodes the chief importance lies in the behaviour of the reaction products under electrolytic conditions but, even in this case, magnesium has proved to be the most advantageous of the two deoxidizing agents. Magnesium oxide and sulphide are soluble in nickel sulphate electrolytes and do not introduce any disadvantageous modifications of the nickel deposits produced. Manganese sulphide, on the other hand, is insoluble and is gradually transported to the cathode surfaces, inducing the formation of rough deposits. If melting of the anode nickel has been effected under normal conditions, an addition of 0.15% magnesium usually suffices to deoxidize the nickel completely; more than 0.20% magnesium is never required while, if for certain personal or local reasons, magnesium and manganese are to be used together, about 0.10% of each suffice. Slight excesses are just as harmless as slightly insufficient amounts of deoxidizing

agents although appreciable excesses should be avoided in the interest of the purity of the anode nickel.

Charcoal is also added as a deoxidizing agent where this material is available in large amounts, and while there are no pronounced disadvantages induced by these additions, magnesium or manganese are to be preferred under all circumstances.

Casting the Anodes

After deoxidation, the nickel is permitted to stand at rest for about five minutes. A test sample is then prepared and submitted to the test described above for the remelted anode scrap. If the sample yields satisfactory results the metal in the crucible is superheated for a few minutes and is then poured into the anode molds.

The sand molds for nickel anodes are made of highly refractory, medium-fat sand, thoroughly dried and provided with a suitable facing usually made up of graphite-clay mixtures prepared with water to form a comparatively thin paste.

The gates are arranged at one narrow side. Two, three or four gates are required, depending on the size and width of the anode. They are made thin and wide. The pouring gate is carried through the cope flask. Perfect venting of the molds is absolutely necessary in the interest of non-porous castings and uniform solution of the anodes in the electrolytes. It is not sufficient to use a permeable sand and to ram the molds so as to obtain a maximum degree of permeability; it is necessary to prepare well-arranged vents and venting channels all around the mold in order to ensure rapid escape of all the air contained in the mold and of the gases liberated by the nickel during solidification.

A very important factor determining the usefulness of sand-cast nickel anodes under practical plating conditions is the rate of cooling. It is sometimes claimed that, in order to obtain maximum uniformity of structure, the anodes must be permitted to cool down as slowly as possible, but this opinion of by-gone days is absolutely incorrect, at least as far as modern nickel plating conditions are concerned. A uniform, fine-grained structure is best adapted to optimum conditions of galvanic solution, and this structure can be obtained only if the following pouring conditions are observed:

1. Pouring temperatures must be maintained as low as possible without endangering the density of the castings and the smoothness of the surfaces.
2. Cooling should be effected at maximum rate down to a temperature below a point favoring the growth of coarse crystals, while final cooling down to room temperature is continued as slowly as possible in order to eliminate all internal stresses which might impair uniform solution of the anodes in the nickel bath.

It has also been found advisable not to place the molds horizontal during pouring but at an angle of about 20 to 30 degrees. It is possible by this device not only to increase the density of the castings but to increase the pouring speed as well.

The above directions apply to sand-cast nickel anodes weighing up to 100 or 120 pounds — especially with regard to the cooling conditions involved. It is necessary for this purpose not to exceed certain wall-thicknesses, the optimum thickness of the anodes

poured in sand molds being 1/6" to 1/2". Heavier anodes do not respond to this treatment or if subjected to the treatment devised for lighter types of anodes are bound to give rise to difficulties.

There can be no doubt that even if the above instructions regarding the melting and pouring of the metal and the cooling of the castings are carefully observed, the center portions of the castings exhibit a somewhat coarser structure than the outer sections, but this difference is not very pronounced. The main thing is that the structure within the same sections is uniform so that, in the course of electrolytic solution of the anodes in the electrolytes, anodic action is always the same at the same time.

Pouring of anode nickel in *chill-molds* does not differ from the method described above. If the pouring temperatures are high enough (about 3050°F.) and, if the molds are placed in an oblique position (20-30 degrees), they are bound to be filled completely and faultlessly. Cooling of the metal down to the temperature of solidification and, finally, to room temperature takes place much more quickly and uniformly, and the structure of the anodes is uniformly fine-grained throughout. The casting skin produced is much thinner and cleaner and can be sandblasted much more readily.

All the advantages of a physical and electrolytic nature induced by rapid cooling and a finely divided uniform structure are thus provided by correct methods of chill-casting, although it will be found that, in some instances, the cooling rates become even too great. It is customary in some anode foundries, for this reason, to remelt the first set of castings (unless the chill-molds have been preheated by some other method). If preheating of the molds does not suffice to decrease the rate of solidification and cooling to room temperature, asbestos plates are sometimes arranged about the anode mold walls in order to slow up the radiation of heat.

Cleaning the Anode

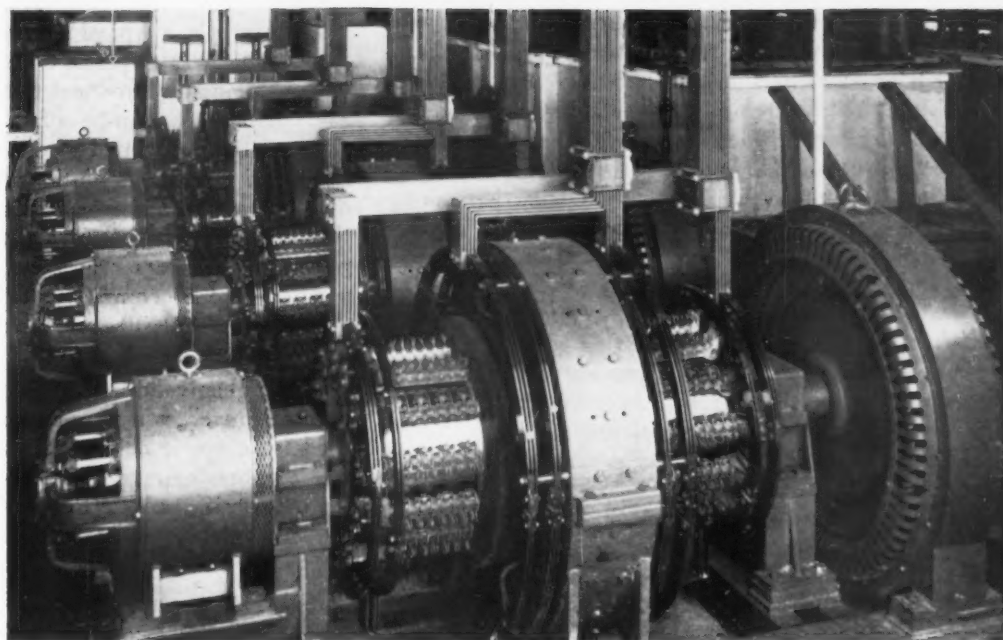
Many methods have been recommended to improve the technical properties of nickel anodes by a suitable finish treatment. The structural properties of the cast anodes can be considerably improved by hammering. These anodes dissolve much more uniformly than untreated cast anodes. By annealing the hammered anodes at a temperature of about 1450-1500°F. the structure is refined still more. Similar results have been attained with the rolling and annealing of cast nickel anodes.

It is absolutely necessary, before placing a cast anode into service, to remove the casting skin which, in sand-cast anodes, consists of a mixture of nickel oxides, silicates and sand, while in chill-cast anodes the skin usually consists of fused oxide films only. These latter films are easily removed by anodic treatment in strong hydrochloric acid, while the casting skin of sand-cast anodes usually requires sandblasting in order to obtain an absolutely pure metallic surface.

Good results are also obtained if the anodes are chemically cleaned every week by dipping them into a solution containing 10-13% sulphuric acid and about 7% hydrochloric acid which removes the yellow and black oxides. The cleaned anodes are then suspended reversed, so that front and rear of the anode are uniformly dissolved.

(Concluded on page 77)

Typical electroplating motor-generator installation. Each motor is rated at 200 hp, 220/3/60. The generators are 10,000/5,000 amp., 9/18 volt machines.



Motor-Generators for Electroplating

By E. G. Schroeder, *The Electric Products Co., Cleveland 12, Ohio*

A COMPLETE electroplating setup is comprised of a great many elements. Tanks, racks, solutions, and so on all form an important part of the electroplating operation, but the most important part of the entire picture is a good, efficient, reliable source of high-current, low-voltage d-c power. It has many times been justifiably said that this low-voltage d-c power is the heart of the entire plating operation.

High-current, low-voltage generators as a part of complete motor generator set have been used for electroplating service for a great number of years, and have definitely proven themselves to be a most efficient and reliable power source.

Even though the early motor-generator sets gave an excellent account of themselves in service, original designs have been greatly changed, modified and improved through the years until, at the present time, today's high-current, low-voltage, heavy-duty electrolytic motor-generators are hard to match for performance and long life.

Basically, all high-current, low-voltage electroplating generators are driven by motors which utilize power from an a-c line, and in all except the very small sizes these driving motors are of the synchronous type. The reasons why synchronous driving motors are most generally used are as follows:

- 1—They provide a source of energy which operates the plating generator at constant speed regardless of the load and therefore help to keep the voltage constant at the plating tank.

- 2—Synchronous motors render very economical power factor correction, which is always a consideration in any plating shop due to the wide use of induction motors for polishing and buffing machines which operate at light load and relatively poor power factor.

- 3—Synchronous motors operate efficiently with a much larger and safer air gap clearance between the rotating and stationary elements than is possible in induction motors.

- 4—Synchronous motors can readily and safely be "built in" and overhung, thereby saving considerable floor space as compared to coupled induction motors.

The standard today for all electroplating generators is shunt wound, separately excited. A number of years ago, some of the electroplating generators were compound wound in an endeavor to keep the voltage more constant at the plating tanks. However, compound-wound generators were abandoned a number of years ago by all leading manufacturers in favor of shunt-wound, separately-excited generators.

Excitation and Voltage Control

In the operation of most electroplating processes, it is desirable and in a large sense mandatory that the operator be able to vary the d-c voltage at the tank over a relatively wide voltage range to provide the proper control of the electrolytic process. The shape

and size of pieces, number of racks in a tank at any particular time, the amount of coating desired, are just a few of the many factors that affect the voltage that may be required in the process. The older, compound-wound machines with some series field strength did not lend themselves to wide variations in voltage, because the degree of compounding would vary with the operating voltage setting. At values of voltage below rated voltage, the machines had a definite tendency to over-compound. They had a rising voltage with increased load, which was very undesirable. While the shunt-wound, separately-excited electroplating generator does not hold absolutely constant voltage with varying load, the variation is small enough to be perfectly satisfactory for practically every electroplating need.

The separate excitation for the generator field can be taken from a d-c shop bus at 125 or 250 volts, but it is most common to supply that excitation power from a direct-connected exciter mounted on the same shaft as the driving motor and the electroplating generator. Therefore, the largest majority of the electroplating M-G sets are three-unit, consisting of the motor, electroplating generator and direct-connected exciter of sufficient capacity for exciting both the generator and motor fields. This arrangement is so common that it has become practically a standard for most manufacturers.

The synchronous motor drive provides constant speed regardless of the load on the generator. Therefore, the direct-connected, compound-wound exciter holds practically constant voltage with varying amounts of field excitation on the main generator. It not only provides constant voltage to the generator field, but also eliminates the change in excitation with voltage drop which would be experienced if the low-voltage plating generator were self-excited. In this manner, the change in generator voltage with load is limited strictly to the IR drop in the series portions of the d-c generator. The direct-connected exciter arrangement also provides much more stable operation than would be experienced if the plating generator were self-excited, particularly at the lower values of voltage setting.

It should further be noted that the plating generator, being of very low voltage, does not lend itself readily to self excitation because, in order to get the number of ampere turns on the shunt field required for excitation, it would take a relatively few turns of heavy wire at high current which would represent a sizeable extra ampere load on the plating generator, commutator and brushes which, of course, would never reach the plating tank and would therefore be ineffective in the actual electroplating process.

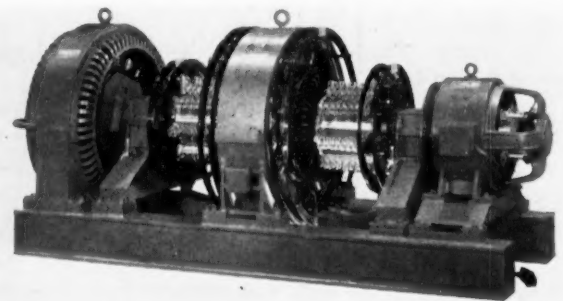
Practically all plating generators, except for the very small ones, with voltage rating of 6 to 24 volts are double-commutator type machines. Each commutator is connected to an electrically independent armature winding and each commutator produces a given number of volts and amperes. The double commutator arrangement

- 1—Makes a better machine mechanically from the standpoint of construction of the commutators.
- 2—Makes it easier to collect the relatively large currents involved.
- 3—Lends a degree of flexibility to the operator.

For example, a typical motor-generator rating would be 10,000/5,000 amperes, 6/12 volts. This means that each commutator produces 5,000 amperes at 6 volts. The commutators can be connected in parallel, i.e., the two negative buses tied together and the two positive buses tied together. With this arrangement, the current or amperes are additive, making the parallel connection 10,000 amperes at 6 volts. By the same reasoning, if the commutators are connected in series; that is, positive of one commutator to negative of the other, then voltage is additive and the machine will be suitable for 5,000 amperes at 12 volts.

The higher voltage machines for other electrolytic processes, such as a 40-volt generator which might be used for chromic acid anodizing, are usually built in single-commutator construction and are usually built for the specific process to a much greater degree than any of the lower-voltage electroplating generators; i.e. in the range of 6 to 15 volts, which may be used for a variety of applications.

Practically every standard electroplating motor-generator set is supplied with a simple generator control panel which provides for manually controlling the generator voltage by means of a plate-type generator field rheostat. Adjustment of the generator field does not affect the exciter field or the motor field, as these are normally supplied in the form of semi-fixed type resistors which can be readjusted on a semi-permanent basis but are not readily adjustable from day to day. Experience has indicated that this is the most satisfactory arrangement, because unauthorized personnel may, for example, reduce the motor field strength inadvertently, which might cause the motor to pull out of step and come to a halt. Breaking of the current may result in work spoilage in the case of many types of decorative plating. Automatic voltage regulators can be used but are rarely applied for general plating service. However, a great percentage of the anodizing motor-generator sets are supplied with fully automatic control panels with voltage regulators. Such automatic control panels start the voltage at a low value to prevent high inrush starting currents, and build the voltage up slowly to a predetermined amount, then hold it at rated voltage for a predetermined time and at the end of the anodizing cycle either interrupt the current or signal the operator that the cycle has been complete. This signal is usually in the form of a red light and bell and the operator merely pushes the stop button which terminates the cycle. Such automatic panels are known as fully automatic program controls. They can be supplied to ac-



Typical synchronous motor-driven generator with direct-connected exciter. Rated at 125 hp, 440/3/60 the synchronous motor drives a 5000/2500 amp., 15/30-volt generator.

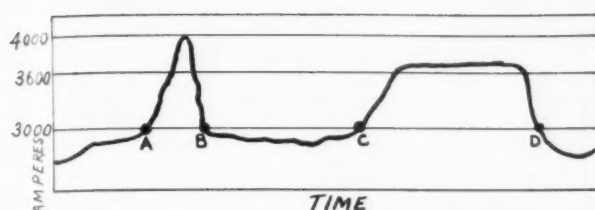


Figure 1.

comply with a wide variation of programs and may incorporate recording meters of various types such as recording voltmeters, recording ammeters, recording ampere-hour meters, etc.

One of the important considerations very often overlooked by the average plater is proper application engineering. It is so often the case that the plater sets up any particular process in the most expeditious manner and does not give proper consideration to the application of the motor-generator power equipment. The significance of this is many times minimized or overlooked, and yet there are definite economies that can result in the proper use of power. Experience has indicated that in connection with the use of modern, efficient and reliable motor-generator equipment the following broad aspects should be considered:

- 1—Detailed analysis of the actual power requirements of each plating process.
- 2—Careful application engineering of the power equipment to make most efficient use of motor-generator equipment available.
- 3—Scheduling of production so that available amperes are working as much of the time as possible.
- 4—Improvement of power factor by the use of leading power factor synchronous motors on modern low operating-and-maintenance cost electroplating motor-generator sets.
- 5—Setting up a program of replacement of obsolete and/or much less efficient power sources and replacement with modern, low maintenance cost motor-generator equipment to produce very sizeable savings in power and maintenance costs.

In connection with point 1 above, it is well to consider what a typical load curve on any particular electrolytic process may look like and consider further how it affects the proper selection and application of motor-generator equipment.

Heavy-duty electrolytic motor-generator sets are traditionally built with a great deal of reserve and overload capacity, and therefore provide economical power sources because they have the ability to "ride over" and satisfactorily handle peak load conditions that might come about. Consider the load curve shown in Figure 1. A 3,000-ampere motor-generator set would be capable of handling the peak load, for a relatively short time, of 4,000 amperes shown between points A & B and a 3700 ampere load of longer duration as indicated between points C & D.

Within recent years, the application of modern motor-generator sets have been such as to render a great deal more flexibility than was originally thought possible in their application. Not too many years ago, it used to be general practice for a plating shop to buy a few large motor-generator sets and then control the

voltage on each plating tank through the use of tank rheostats. These have within recent years pretty much passed out of the picture, because they not only wasted a great deal of power but also provided poorer control and voltage regulation than was acceptable in a great many cases. Present thinking today is to properly apply a smaller motor-generator set to each process and to control the voltage in a very large number of fine steps with the generator shunt field rheostat, thereby giving very smooth and accurate control over relatively wide voltage ranges and without appreciable loss of the inherent high efficiency of the motor-generator set throughout its operating life.

Also, today it is very common practice to operate smaller or medium sized modern motor-generator sets in parallel for large tanks by splitting the anode rails and thereby rendering a great deal more flexibility to the overall set-up than would be possible with a single large motor-generator set. For example, consider a large nickel tank that may require 20,000 amperes. Instead of a single 20,000-ampere generator, two 10,000-ampere or perhaps three 6000-ampere machines may be used. Then at any later date, if the process changes, these smaller units may be used in a number of other places efficiently.

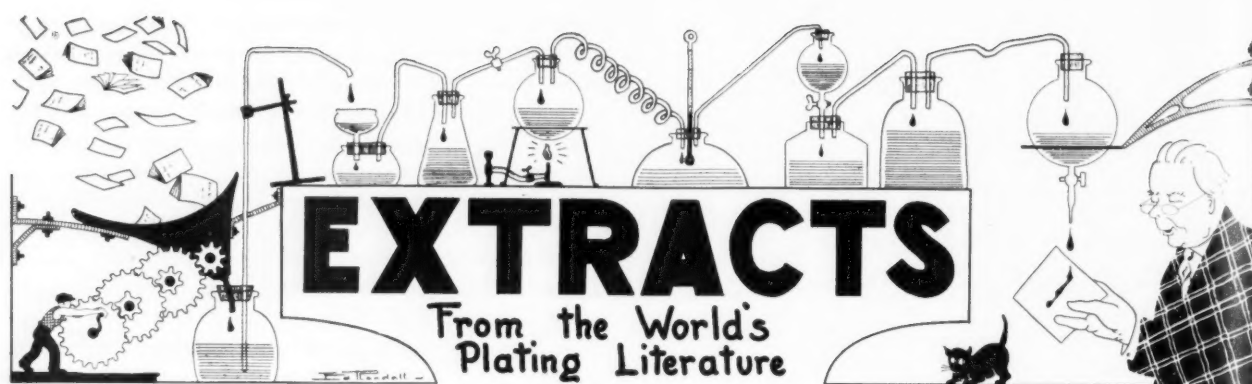
Electric power is the heart of the plating operation. It controls the operating continuity of an investment many times greater than itself.

CAST NICKEL ANODES

(Concluded from page 74)

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Research on Electrotin Flowing Process

V. Seul and R. Mintrop: *Stahl und Eisen*; vol. 70, No. 25, pp. 1154-1166.

During hot-dip tinning of steel an intermediate alloy layer of FeSn_2 is formed, corresponding to the hard zinc layer in hot dip galvanizing. The formation of such an intermediate layer is of fundamental importance to the adhesion of a tin coating on steel, and for the corrosion resistance of the coating. The structure of an electrotin coating is dependent to a large extent on the type of tin flowing process applied. The present research had the object of clarifying the influence of the heat treatment stage on the tin coating. With hot-dip tinning, a dense adherent layer is formed between the base metal and the pure tin coating, as was shown by metallographic examination. It was seen that the attack of the molten tin on the steel proceeds along the ferrite crystal boundaries. With the short fusing period given to a flowed electrotin coating, this intermediate coating is formed much less markedly and does not appear to be a dense, adherent band as with hot-dip tin coating.

The heat treatment investigations on electrotin coatings were conducted on double sided tin coatings on steel strip, deposited from an acid tin bath under normal operating conditions, the tin coatings being 10, 15, 20, 25 and 30 g./sq. m. thick and a comparative test was made with a hot-dip tin sheet. The influence of the thickness of the tin coating, the tin flowing temperature and time on the surface characteristics of the tin coating were examined. The metallographic macrostructure examination was at 30 diameter magnification. In all cases with electrotin, the heat flowing stage causes a reduction in the micro-roughness of the tin surface. On the other hand, however, the macro-roughness increases. During the tin flowing stage, the tin coating fuses partially together and forms a markedly rippled, uneven surface. This becomes all the more marked, the thicker the tin coating. Tests showed that the biggest change in the surface characteristics of the melted tin coatings occurred when passing from the thickness of 10 to 15 g./sq. m. When heat flowing tin coatings of only 10 g./sq. m. thickness, relatively smooth flowed coatings were obtained. With a tin coating thickness of about 15 g./sq. m. here is located also the economic tin coating limit, up to this point electro-tinned coatings being superior to hot dip coatings. Increasing the tin flowing temperature and lengthening

the melting time, it was found, leads to a stronger running together of the tin coating.

Macro-photographs of heat flowed coatings showed crater-like roughening of the surface. This indicated the generation of gas or water vapor or both together. This favors the running together and roughening of the flowed tin surface and acts unfavorably on the surface mirror effect and the corrosion resistance. The gas evolved would be primarily hydrogen, while the water would originate from occluded electrolyte in pores on the steel surface during electrotinning. It was established that the running together of the tin coating and consequent surface roughening during the tin flowing stage could be avoided to a considerable extent by the application of low tin-flowing temperatures just above the melting point of the tin and using shorter tin-flowing treatment times. The effect of preheating before the actual tin flowing was then studied. It was found that if the tinned steel strip is first preheated to a temperature below the melting point of the tin and the tin is then subsequently heat flowed, the gas expulsion is completed for the greater part and by migration phenomena in the solid state, the formation of an intermediate iron-tin alloy between the tin and the steel, takes place. This also causes the wettability of the tin surface to be considerably improved during the tin flowing stage. It was found that the effect of the preheating is all the greater, the closer the preheating temperature approaches the melting point of the tin.

Plating Zinc Alloy Die Castings

K. Loehberg and H. Nann; *Metallberflaeche*, vol. 3, No. 11, pp. B161-B165.

Before copper plating the parts are dipped, after cleaning, in a 2-3% hydrochloric acid solution, until a vigorous gas development starts. The immersion is ended in about 5 seconds. This dip in hydrochloric acid has been found to give extraordinarily good results. It causes a neutralization of the remains of the alkaline cleaning solutions and removes the oxide film which is always present. This causes the adhesion of the subsequent copper plate to be improved. The parts are thoroughly rinsed after the acid dip and passed directly, without delay, into the copper bath as the metal surface from the acid dip bath is very oxidizable.

Alkaline cyanide baths are used for copper plating, preferably the Rochelle salt bath. This has the composi-

tion: 20 g./L. copper cyanide; 32 g./L. sodium cyanide; 50 g./L. Rochelle salt. This composition corresponds to a copper content of about 14 g./L. and a free cyanide content (NaCN) of about 5 g./L. Working bath temperatures is $50^{\circ}\text{C.} \pm 5^{\circ}\text{C.}$ Free cyanide should be controlled every 2-3 days. The copper is satin smooth and easily polished; a 20 micron coating can be obtained in 45 minutes. Care must be taken when polishing that the coating is not polished through at edges or corners. Microscopic examination showed that, at the edges, the copper coating could be reduced in thickness from 26 down to 12 microns during the polishing. Thus, with a thinner plate, the metal removed in this way could easily lead to severe corrosion troubles in use. If the zinc becomes bared in places during the polishing of the copper, the parts cannot be passed to the nickel bath as otherwise undesirable black marking and streaking would occur. Even though the bare areas would be slight in extent and would be grown over during the nickel plating, even if they did not flake with the nickel polishing, the coatings would peel away with the chromium plate. The copper coating should be of sufficient thickness so that the die casting to all intents and purposes now consists of copper and can be plated in any nickel bath. This is necessary because nickel baths working at high current densities must be used for large scale production. Before the copper plated parts are passed to the nickel bath, and this must be done with current on, they are given a short dip in a 5-10% sulfuric acid solution to remove any copper solution and any oxide film which has formed. Copper coated parts which have been polished before dipping must be electrolytically cleaned prior to using the dilute sulfuric acid.

The influence of pores in the zinc die-cast surface on the durability of the plate was investigated. From tests, the following conclusions were drawn. Pores in size up to about 300 microns, unless a whole colony was present, were covered over during copper deposition. The same was the case with pores over about 1,500 microns in size, which were covered over — this latter pore size can be regarded as a surface depression. Salt spray test investigations were conducted to ascertain the minimum thickness of deposit required to give good corrosion protection. It was clearly shown that resistance to the salt spray test of 96 hours or more requires a minimum coating thickness of about 25 microns (copper plus nickel). Obviously also, with increased coating thickness, the harmful effect of "covered" pores is balanced out. With coating thicknesses below 16 microns (copper plus nickel) the corrosion resistance behavior is bad. These thicknesses are quoted on the basis that the plated coatings are satisfactorily sound, i.e. free from pores or cracks. Die-cast parts examined, which showed up worse on test than would be expected from the coating thickness, had failed through the presence of pores, cracks and flaws in the plate.

Determination of Carbonates in Cyanide Baths

W. Savelsberg; *Metalloberflaeche*, vol. 5, No. 8, pp. B116-B117.

The most certain method of measuring the carbonate content is given as follows. A measured volume of the solution is boiled with a solution of calcium chlor-

ide and the precipitate is filtered off and washed several times. The precipitate is then dissolved in dilute hydrochloric acid and this solution is precipitated on boiling with ammonium oxalate, with the addition of ammonia until the solution smells of ammonia. The precipitate is then filtered out, washed three times with hot water, washed off the filter, dissolved on heating in dilute sulfuric acid and titrated with potassium permanganate solution. 1 cc. of N/10 permanganate solution \equiv 2.2 mg. $\text{CO}_2 \equiv$ 5.3 mg. $\text{Na}_2\text{CO}_3 \equiv$ 6.9 mg. K_2CO_3 .

It is convenient to take 25 cc. of the solution and, after treating as above, the sulfuric-oxalate solution is made up to 250 cc. and a 25 cc. aliquot is titrated \equiv 2.5 cc. of the original solution. The KMnO_4 solution is preferably made up by weighing out 3 g./L. KMnO_4 (instead of 3.16 g./L.). The cc. of KMnO_4 then used give the content of the bath in terms of Na_2CO_3 directly in g./L.

The chemical reactions involved in the estimation are:

- (1) $\text{K}_2\text{CO}_3 + \text{CaCl}_2 \rightarrow 2\text{KCl} + \text{CaCO}_3$.
- (2) $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$.
- (3) $\text{CaCl}_2 + (\text{NH}_4)_2\text{C}_2\text{O}_4 \rightarrow \text{CaC}_2\text{O}_4 + 2\text{NH}_4\text{Cl}$.
- (4) $\text{CaC}_2\text{O}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{H}_2\text{C}_2\text{O}_4$.
- (5) $5\text{H}_2\text{C}_2\text{O}_4 + 2\text{KMnO}_4 + 3\text{H}_2\text{SO}_4 \rightarrow 2\text{MnSO}_4 + \text{K}_2\text{SO}_4 + 10\text{CO}_2 + \text{H}_2\text{O}$.

The process is a little more involved than the usual method, which is to precipitate barium carbonate from the solution with barium chloride and to titrate this with standard hydrochloric acid solution. The method given, involving oxalate precipitation and titration with KMnO_4 , is more accurate because barium carbonate is not entirely insoluble so that the carbonate content found by the barium method is always somewhat less than the actual content. On the other hand, calcium carbonate is practically insoluble and the oxalate absolutely insoluble so that all the bath carbonate is available for the analysis.

Simple, Rapid Tests for Metal Testing and Differentiation

By A. Kutzelnigg; Paper read to meeting of German Metals Society at Stuttgart, 1951.

A study was originally made of the reactions of organic dyes and organic reagents with metal surfaces for the purpose of metal coloring. This study was subsequently extended to the development of simple, rapid metal tests. Up to now, the reaction possibilities of organic reagents with metals have been neglected. Dimethylglyoxine has been used for metal pore testing purposes but only in the form of a strongly ammoniacal solution.

Recently it has been found that dimethylglyoxine also, without any other addition, in the form of a paper impregnated with the solution and moistened with water, reacts and is decomposed within a few minutes when in contact with metallic nickel. As a further development of this observation, tests papers for other metals were also developed.

For the identification of zinc and cadmium, a reagent paper prepared with dithizone can be used, which is moistened with an organic solvent. Here again also,

coloration of the paper occurs after a few minutes. With zinc a raspberry red color is obtained and with cadmium, the color tends towards orange. It is known that other metals give colorations with dithizone which to some extent can be differentiated from the zinc and cadmium color only with difficulty. For practical purposes this circumstance is not very disturbing as a confusion of zinc or cadmium with lead or copper would hardly be likely to occur for other reasons. On the other hand, differentiation of zinc from cadmium, merely from the aspect of appearance alone could be difficult and the new method does provide a means for achieving this.

The tests for tin and magnesium are based on the reduction of dyestuffs by these metals. Neutral red paper placed on Elektron alloy metal that has been moistened with water, becomes yellow after a few seconds. Methylene blue paper can be used for the tin test, the paper being moistened with dilute hydrochloric acid. Tin passes into solution as stannous chloride and a very small concentration of this is sufficient to bleach the dyestuff.

For the aluminum test, eriochromecyanine paper has been found suitable. There occurs by a pinpoint effect, at first a bright violet-red coloration. This pinpoint effect can be attributed to the fact that the weak places in the natural oxide film at first react.

The technical significance of these test papers lies in the fact that an identification of a certain metal can be conducted in a few minutes by an unskilled operator. Thus, for example, a mix-up of anode metals of similar appearance since as zinc and cadmium with the resultant disastrous consequences, can be prevented. The sorting out of old metal which has been in store is also greatly simplified by this means. The test is of course, quite non-destructive.

Faults in Chrome Plate Baths and Their Avoidance

Galvano (Paris); vol. 20, No. 178, pp. 23-25.

The case is considered when the bath is not working regularly and requires frequent additions of sulfuric acid. The normal addition to the bath is chromic acid but, to give correct results, certain baths require additions of sulfuric acid with each addition of chromic acid and even between two such additions. Several causes can explain this abnormal acid addition. (a) The anode surface is insufficient or the parts are placed in the bath in a greasy or dirty condition and these are two factors which influence the rapid increase of the trivalent chromium content. As the ratio of chromium chromate to sulfuric acid must be constant to obtain a satisfactory deposit, it becomes necessary to add sulfuric acid.

These acid additions can become very dangerous. In a hot bath of high concentration, the ratio CrO_3/SO_4 is not significant if one keeps within normal figures and the SO_4 content has all the lesser importance as the bath is richer in chromic acid. For example, a bath of 250 g./L. of CrO_3 takes 2.3 to 2.8 g./L. of sulfuric acid to give maximum throwing power, while a bath containing 450-500 g./L. CrO_3 functions correctly with an SO_4 content which can reach 6-7 g./L. It is not the same however with the ratio $\text{Cr}_2\text{O}_3/\text{SO}_4$. If the quan-

tity of trivalent chromium in the bath increases appreciably for any reason, the first additions of sulfuric acid serve to re-establish the equilibrium $\text{Cr}_2\text{O}_3/\text{SO}_4$ and reduce the faults due to the excess of trivalent, but do not eliminate them entirely and the time arrives when the bath no longer has any throwing power because of the excess of trivalent chromium.

The iron content of the bath can be increased either by attack on the plating tank or by the use of steel anodes. Acid additions will cause iron spotting-out trouble to disappear but caution is necessary here because additions of SO_4 do not eliminate the iron but merely suppress its effects. There are no real practical methods for eliminating the iron in a chromium bath.

Where a chromium bath is being worked intensively and, particularly where a small capacity bath is installed, together with parts having a large surface area being processed of hollow parts, there is considerable spray entrainment of chromic acid which necessitates frequent additions of chromic acid to maintain the bath at its initial density. Thus, in a relatively short time, all the solution might have been renewed. In such cases it is usual to make additions of sulfuric acid to maintain the correct ratio of CrO_3/SO_4 .

Constant additions of chromic acid to the bath may be required as seen above, because a bath of too small a capacity is being operated at an intensive rate. Again, chromic acid additions may be required to reestablish the ratio $\text{CrO}_3/\text{Cr}_2\text{O}_3$ because of enrichment of the bath in trivalent. This, however, is a practice to be condemned. It is sounder to establish the cause of the build-up and to eliminate it, i.e. to reduce the trivalent chromium content by known means and to avoid its recurrence.

RUSSIANS CLAIM NEW METHOD

(Concluded from page 69)

tus and measuring instruments; and the second, which housed the machinery which transformed the alternating current from the line into direct current. The power from the generators was then transmitted to the tanks through thick copper cables.

Under the new method, the article claims, all this would be done away with. Scarce copper would no longer be "wasted" in this way and current from the power line would be used for the process. The electroplating shop of the new type would no longer require a generator room and heavy bus bar. Each tank would receive its current from a small, individual step-down transformer. Under these conditions, the article concludes, the whole process could be set in motion or stopped by simply pressing a button.

It has not been possible to find any reference to the new process in such Soviet technical publications as are available outside Russia — practically none of these are allowed out of the country by the censorship — and the efficacy of Presnyakov's method cannot, therefore, be judged. The Ministry's reluctance, which is so sharply condemned by "Pravda," to exploit the invention may well be due to some technical flaws in it. Or, again, the inventor's claim may be as "valid" as "the invention of electroplating" which "Pravda" attributes in the same article to the Russian physicist B. S. Yakobi.

Shop Problems

Abrasive Methods—Surface Treatments—Control
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Pickling Phosphor Bronze

Question: We would like to know the best method of pickling and cleaning phosphor bronze sheet. We have not found the sulfuric acid pickle satisfactory for this purpose and the nitric-sulphuric bath very rapidly loses its strength and efficiency.

Answer: The process of cleaning phosphor bronze requires a secondary pickling operation.

After the regular sulphuric acid pickling, the parts are treated in a bath of 10% sulfuric acid to which is added $\frac{1}{4}$ to $\frac{1}{2}$ lb. of sodium dichromate for each gallon of solution.

Copper on Stainless Steel

Question: We are very much interested in the application of copper to stainless sheet metal and would appreciate information regarding processes used commercially.

Answer: Two methods are in common use for plating copper on stainless steel. The preferable one is the Wood solution which is made up of two pounds per gallon of nickel chloride and one pint per gallon of hydrochloric acid. The parts are given a $\frac{1}{4}$ to 1 minute treatment at six volts.

The other process which gives satisfactory results is the Gardam solution. The parts are treated as the cathode at 35 C and 150 amperes per sq. ft. in a solution consisting of 240 grams per liter of single nickel salts and 50 grams per liter sulfuric acid.

Both of these treatments produce an adherent but very thin deposit of nickel on the stainless steel and the articles can be transferred to the copper plating solution for proper copper thickness.

Pitted Nickel After Filtering

Question: In our nickel tank we

have a continuous filtering system which pumps the solution up to a filter press located four feet above the nickel tank. The filtered solution drops back as a spray from a height of four feet to the tank.

As we are able to observe, the filtration is perfect but we do get a lot of pitting. When the pump is stopped, the pitting decreases.

Answer: It is not good practice to allow a nickel solution to become aerated as it leaves the filter press. Rather than have the solution splash down into the nickel tank, the outlet of the filter should be placed below the surface of the solution so that no aeration takes place.

When the solution becomes saturated with air, pitting is invited due to the fact that bubbles of air will form on the work and act as a nucleus for pitting.

Cathode Efficiency of Nickel Plating Solutions

Question: Will you kindly tell us what the cathode efficiency of the nickel plating bath is and whether this efficiency varies to any extent with current density, temperature and pH?

Answer: The cathode efficiency of most nickel plating solutions ranges above 95% in the pH range from 3 to 5. For a Watts-type solution composed of single nickel salts, nickel chloride and boric acid, it has been found that the cathode current efficiency varies only slightly in the temperature range from 75 to 160°F. and at 50 amps./sq. ft. with a pH of 5, the cathode efficiency is between 98 and 99.4%.

As the pH falls, the cathode current efficiency slowly decreases until a pH of 3 is reached. Below 3, the efficiency may drop off from 10 to

50%, the drop being greater at the lower current densities.

Current density had almost no effect on efficiency between the ranges of 2 and 50 amps./sq. ft. It may thus be seen that nickel plating solutions operate at high efficiency under wide conditions with the exception of low pH's.

Iron in Chromium Bath

Question: Our chemist says there is iron in our chrome solution. Is there any way to remove this metal?

Answer: According to N. A. Tope, iron may be removed successfully by plating with a mercury cathode. Unfortunately, chromium is co-deposited with the iron and rapidly forms a stiff chromium amalgam, which appears as a crust on the mercury cathode. This crust must be removed from time to time so that the plating process may continue.

Although ultimately the iron may be plated out by this method, the method is not considered sufficiently economical to apply to the large scale purification of these solutions.

Preparation of High Speed Steel for Chromium Plating

Question: What is a good method for preparing a surface of high speed steel or high carbon steel for hard chromium plating? Please give specific operations necessary to insure good adherence and to eliminate the possibility of passive spots which sometimes result.

Answer: As far as we know, high speed steel and high carbon steel are treated in the same way as common steels prior to chromium plating, namely — cleaning with alkali, rinsing, acid dipping and anodic etching either in sulfuric or chromic acid.

Some alloy steels occasionally give trouble with passive spots. In such cases, it is general practice to eliminate the reverse current treatment. The article, after cleaning, is dipped in a very strong solution of hydrochloric acid (1-1), rinsed and plated.

Hard Nickel Plating

Question: Will you please give us a formula for hard nickel plating? We have some parts to build up with hard nickel and these parts must be subjected to a hardness test.

Answer: The following two solutions produce hard nickel deposits:

No. 1 Moderately hard — 230-260 Vickers Hardness.

Nickel Chloride — 40 oz./gal.
Boric acid — 4 oz./gal.
Temperature — 140°F.
Current Density — 20-100 amps/sq. ft.
pH — 2.0 electrometric

No. 2 Hard—380-500 Vickers Hardness.

Nickel Sulfate — 24 oz./gal.
Ammonium
Chloride — 3.3 oz./gal.
Boric acid — 4.0 oz./gal.
Temperature — 120-140°F.
Current Density — 25-50 amps/sq. ft.
pH — 5.6-5.9 electrometric

In all cases, increasing the temperature and decreasing the pH and the current density will result in softer deposits, while the reverse will result in harder deposits.

Removal of Excess Sulfate From a Chromium Bath

Question: By accident some one added too much sulfate to our chromium bath. It is our belief that, by adding a salt to the solution to reduce the sulfuric acid, another acid would be formed. Please advise if you know of any way to remove the excess acid.

Answer: To remove excess sulfate you should add two ounces of barium carbonate for each ounce of sulfuric acid to be removed. This will precipitate the sulfate as barium sulfate and at the same time neutralize the acidity now present. Other products produced by this method are water and carbon dioxide gas which are not deleterious to the bath.

Iron in Cadmium Solution

Question: We would appreciate knowing what effect a small iron content would have in a cadmium solution. Our bath is brightened with a patented brightener.

Answer: Small amounts of iron in a cadmium bath apparently have no detrimental effect. However, if the iron, as ferrocyanide, reaches a concentration of $\frac{1}{4}$ oz./gallon, it will interfere with the determination of total or free cyanide. In the plating bath, ferrocyanide increases the resistivity of the bath and will cause rough deposits.

Removal of Sodium Carbonate From Cadmium Solutions

Question: We are interested in securing information regarding the special gypsum used in removing sodium carbonate from cadmium plating solutions. It will be appreciated if your office will furnish us with this information.

Answer: We would advise that this process has been patented by du Pont under patent No. 2,164,924. This company markets the material as a fine powder suitable for direct addition to the plating solution under the name of DuPont Carbonate Remover. To remove one ounce of sodium carbonate, 1.6 ounces of gypsum are used.

Recovery of Cadmium From Cadmium Strip

Question: I should like to have information on the recovery of cadmium from a strip made of ammonium nitrate and water.

Answer: The cadmium can be precipitated from this solution by making it strongly alkaline with caustic soda. This will decompose the ammonium nitrate, driving off the ammonia and precipitating the cadmium as cadmium hydroxide which is a white mud.

If the cadmium hydroxide is washed completely free of nitrates, it can be returned to the plating solution. However, it must be remembered that the use of cadmium hydroxide instead of anodes for supplying the metal content of the solution will result in a large increase in the caustic soda content of the solution.

Scum on Acid Strip

Question: In stripping some zinc plated bimetals we notice a black scum coming to the surface of our 1-1 Hydrochloric acid bath. We have stripped other lots without encountering this scum, so we wonder if there is something in the plate which was not there before.

Answer: If the zinc deposit is of the bright zinc variety, it is possible that the black scum consists of organic and metallic brighteners insoluble in the acid. The scum may also be carbides from the surface of the basis metal, if steel.

Unreliable Zinc Plating Solution

Question: Until recently, we have been cadmium plating all of our ma-

terial. However, lately we changed over to zinc plating. For some reason we are obtaining very irregular plating. By this, we mean that we will have a very bright finish for a day or so and then using the same cleaning method and the same zinc bath, our plating will suddenly show up dark. Our zinc bath is tested regularly and, therefore we cannot account for the variation.

Answer: Dark deposits in zinc solutions are generally due to minute amounts of impurities. The dark color you get at intervals may be caused by such a condition.

If the anodes remain in the solution overnight, some zinc will be dissolved by the caustic in the bath. Any impurities which might be present in the anodes will accumulate in the solution and will result in a dark deposit. The impurities that are dissolved while the anodes are working will be plated out practically as fast as they dissolve and, in such a case, you would not get dark deposits. We suggest you test for this by removing the anodes from the tank at night and see if you get dark deposits the following day after the anodes are put back.

Another cause of your difficulty may be metallic dust in the air due to polishing done in the vicinity. Check into this possibility.

Lowering the pH of Zinc and Cadmium Baths

Question: Will you kindly enlighten me as to the possibility of using sulfuric acid in lowering the pH of a zinc or a cadmium plating solution, provided proper ventilation conditions are maintained? Is this proper method to lower pH?

Answer: If proper ventilation facilities are available, addition of acid is a suitable industrial method to lower the pH of zinc and cadmium cyanide baths. However, since these solutions are highly buffered in their ordinary operating ranges, you may find that an appreciable amount of acid is required to lower the pH, especially in the zinc baths which contain much free caustic.

Are you sure that lowering the pH of your solution is the answer to your problem? Ordinarily, the control of pH is not considered necessary in the operation of these solutions and control of metal, cyanide and caustic is general practice.

Nickel Plating Stainless Steel

Question: How may we plate stainless steel to make it absolutely non-corrosive?

Answer: It is possible to nickel plate stainless steel to make it corrosion resistant. The method consists of first cleaning the metal by the usual methods and striking in a solution composed of:

Nickel Chloride 32 oz./gal.
Muriatic Acid 1 pint/gal.

Use this bath at room temperature and electrolyze for 1/4 to 1 minute at 6 volts.

In this treatment, the strong evolution of gas and the effect of the electrolysis removes any oxide film and at the same time a thin film of nickel is deposited. After this operation, the work is transferred directly to a regular nickel bath.

Chromium can, of course, be applied over the final coat of nickel.

Brightening Gold Rings

Question: We are often faced with the problem of brightening deep sections in the heads of gold rings which have been cast and where it is impossible to get at the recess with a polishing brush and where it is not practical to tumble. Can you help us with some method of doing this?

Answer: Stripping of cast gold rings can be done successfully in a solution of sodium cyanide with reverse current. The alloys used in cast gold oc-

asionally cause black areas, particularly in piercings and indentations if a small cathode area and low temperature are used and insufficient cyanide is present in the stripping operation.

In your case, it is suggested that the rings be first pickled in a boiling 10% sulfuric acid solution for a few minutes, rinsed and stripped in the following solution:

Sodium Cyanide 6 ozs.
Rochelle Salts 3 ozs.
Potassium Ferrocyanide 3 ozs.
Water 1 gal.

Operate at 190°F., 6 volts, reverse current on the rings, sheet iron cathode. Stripping time is 15 to 60 seconds with slow agitation of the work.

To assure that the rings will be bright, clean and evenly stripped, the operating factors and the solution concentration should be controlled carefully. Too low a cyanide concentration will cause black areas and too high a concentration will cause a fast uneven stripping.

Scale on Pewter

Question: In the refinishing of pewter articles prior to silver plating, we frequently find a scale that cannot be removed by scratch brushing and which affects the adhesion of our silver plate. How can we remove this scale?

Answer: In the case of replating pewter articles, it is possible that what remains of the previously applied silver has been absorbed into the pewter

metal. This plus the corrosion pits which have developed means that the surface must be refinished. To refinish pewter, use a cloth sewed buff and fine pumice moistened with a vegetable or light mineral oil. Buff the work until all the old silver is removed and until all pits are removed. After coloring the work, clean in a solvent and wipe dry. Then scratch brush with a fine wire wheel using clean soap bark water liberally. Finally clean in a very mild alkaline cleaner suitable for this base metal. Your piece is then ready for silver striking and, finally, plating.

Gold Dip Finish

Question: Can you give me any idea how long a gold dip finish should last without tarnishing on atomizers? The parts are not lacquered and after 4 to 6 months service, they develop a brownish tinge in spots. Is this the fault of the coating?

Answer: 4 to 6 months service on the fairly hard usage atomizers get is good service for an unlacquered gold dip finish. The use of lacquer would prolong this service life considerably.

For a really durable finish, the atomizers should be nickel plated, then gold plated. Of course, this is a more expensive operation. The nickel would provide the resistance to tarnish and would prevent the brass underneath from bleeding through, which is the cause of the brownish tinge now present on your work.

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Patents

Recently Granted Patents in the Metal Finishing Field

Electrodeposition of Alloys of Molybdenum with Cobalt, Nickel, and Iron

U. S. Patent 2,599,178. M. L. Holt and H. J. Seim, assignors to Wisconsin Alumni Research Foundation.

Method of electrodepositing an alloy of molybdenum and a metal of the class consisting of cobalt, nickel and iron which comprises: passing current between an anode and a cathode on which the alloy is to be deposited in an aqueous electrolyte consisting essentially of 60 grams per liter of a sulfate selected from the class consisting of cobalt, nickel and iron, citric acid in an amount in excess of the sulfate, 2 to 40 grams per liter of sodium molybdate, and sufficient ammonium hydroxide a pH of from 4 to 8.

Abrasive Articles

U. S. Patent 2,599,506. C. E. Wood-dell, G. VanNimwegen and E. T. Hager, assignors to The Carborundum Company.

An abrasive article comprising abrasive grains and a bond therefor comprising a hard-vulcanized copolymer of about 50-90% of a compound selected from the group consisting of conjugated diolefins containing from 4 to 6 carbon atoms and the methyl, phenyl, vinyl and cyano substitution products thereof with an ester of an unsaturated carboxylic acid and an alcohol selected from the group consisting of aliphatic alcohols containing from 1 to 4 carbon atoms, the nitro substitution products thereof and unsaturated monohydric alcohols.

Pickling Chromium Alloys

U. S. Patent 2,598,889. W. E. Caugherty, assignor to Allegheny Ludlum Steel Corp.

A method of the character described for removing scale from straight chromium alloys to provide a bright surface finish which comprises, immersing such alloys in an aqueous solution consisting of nitric acid and a univalent solution-soluble alkali-metal

fluoride salt, the fluoride salt being in a sufficient minimum amount of about 1% to act upon the scale and make it subject to effective action by the nitric acid and being within a maximum amount such that etching of the alloys will be substantially eliminated and not above about 8%, the nitric acid being in a sufficient minimum amount of about 5% to remove the scale and within a maximum amount of about 10%, and the proportioning of the fluoride salt and nitric acid being such that a substantially complete removal of the scale is effected.

Emulsion Cleaner

U. S. Patent 2,599,729. J. H. Secrist, assignor to Detrex Corp.

A noncorrosive metal cleaning composition consisting of the following ingredients in substantially the proportions specified:

Trichlorethylene (stabilized)	cc	100
Triethanolamine oleate	grams	2
Monoethanolamine oleate	do	6
Sodium oleate	do	1
Water	cc	11
Benzyl thiocyanate	grams	3

Etching Chromium

U. S. Patent 2,599,914. P. J. Hartsuch and C. Wachtl, assignors to Lithographic Technical Foundation.

The process of removing chromium from a chromium plated surface which comprises subjecting the surface to etching by applying thereto a solution containing aluminum chloride as its active ingredient and a salt selected from the group comprising zinc chloride, stannic chloride and ferric chloride as another ingredient.

Grinding Wheel Blower

U. S. Patent 2,599,952. W. Strayer.

In a grinding wheel, the combination which comprises a spindle having a threaded stud on the end thereof, a bushing threaded on the said stud and having spaced parallel plates with fan blades between the plates and with

an opening through the center of the outer plate positioned in a plane perpendicular to the axis of the bushing forming a head for the bushing, and a grinding wheel positioned on the bushing and clamped between the said head and end of the spindle.

Abrasive Head

U. S. Patent 2,601,499. G. W. Bruner, assignor to Vonnegut Moulder Corp.

In an abrasive head to be driven by a driving spindle including an annular series of radially-extending brushes between which abrasive strips are adapted to be extended, the combination therewith of a hub adapted to be secured on said spindle for rotation therewith, a hub plate extending radially from said hub and secured thereto, a cap plate surrounding said hub and spaced from said hub plate for mounting said brushes therebetween, an abrasive anchoring and winding drum rotatably mounted on said hub for anchoring and winding abrasive strips thereabout, said drum having a series of abrasive limiting lugs projecting from one end thereof through said cap plate, an abrasive adjusting collar rotatably mounted upon said hub having ears projecting inwardly between said lugs spaced from the adjacent ends thereof to permit of predetermined relative rotation between said collar and drum, an annular series of interlocking teeth carried by said collar and cap plate respectively for interlocking said collar and said plate in resetting position, and a clamping knob threaded on said hub for clamping said collar in interlocked relation with said cap plate.

Plating Machine

U. S. Patent 2,601,535. L. E. Lancy.

An apparatus for electrolytically treating and advancing a series of work articles in a transversely-horizontally extending relationship longitudinally along and within a longitudinal tank having a treatment solution therein.

Polishing Apparatus

U. S. Patent 2,601,531. F. J. Zeller.

Polishing apparatus comprising a framework having an upright post at each side, a shaft, bearings on the framework adjacent the tops of said upright posts for slidably and rotatably mounting said shaft, a motor on the framework connected to operate the shaft, a crosspiece between said uprights supporting said motor, a lever pivoted adjacent the motor and engaging the shaft for imparting longitudinal movement thereto, a cross bar to which an upright post at one side of the framework is pivotally connected at the bottom, a second cross bar to which the lower end of the upright post at the opposite side is pivotally connected, a third cross bar above the second cross bar and rigidly connected thereto and a stop on the third cross bar for the last-named upright.

Method of Cleaning Hot-Dip Tin-Plate

U. S. Patent 2,601,863. P. N. Murphy, assignor to United States Steel Co.

In a method of finishing hot-dip tin-plate, the steps including delivering sheets as they emerge from the palm oil floating on the molten tin in a tin-pot, before substantial cooling of the sheets, directly into a hot soda-ash solution having a concentration between .5% and 1.5%, then passing the sheets through a second hot soda-ash solution having a concentration between .10% and .25%, thereby removing substantially all the oil adhering to the sheets on leaving the tin-pot.

Descaling in Fused Baths

U. S. Patent 2,601,864. A. F. Holden.

A work descaling salt bath adapted to be operated at a temperature above 1000°F. consisting essentially of a mixture of chlorides from the group consisting of alkali metal chlorides and alkaline earth metal chlorides, together with 2% to 10% of a fluoride selected from the group consisting of the fluorides of sodium, potassium and barium, and 1/2% to 5% of silicon carbide.

The method of descaling metal parts comprising immersing them in a molten bath consisting essentially of a mixture of chlorides from the group consisting of alkali metal chlorides and alkaline earth metal chlorides, 2% to 10% of a fluoride selected from the group consisting of the fluorides of

sodium, potassium and barium, to which silicon carbide is added from time to time to maintain 1/2% to 5% of silicon carbide in the bath, and operated at a temperature above 1000°F., the parts being retained in the bath until heated to the temperature of the bath; the parts then being removed from the bath and quenched in water.

Roller Etching Machine

U. S. Patent 2,602,024. F. R. Lear, assignor to Industrial Gravure Co.

In combination with an etching machine, a vertically disposed work-holding mandrel positioned within a casing provided with intercommunicating radially arranged tanks, a roller supported for rotation by said mandrel, means in said radially arranged tanks for impelling a liquid substantially radially with respect to said mandrel, and means for controlling the material applied to said roller.

Carbonyl Plating

U. S. Patent 2,602,033. J. J. Lander, assignor to Bell Telephone Laboratories, Inc.

The method of plating an object which comprises heating the object to be plated to a temperature sufficiently high to decompose carbonyl vapor of at least one metal selected from the group consisting of tungsten and molybdenum, passing said vapor along with hydrogen and water vapor to the extent of not over fifteen molecular per cent of the hydrogen over the object to be plated while it is maintained at said decomposition temperature, and while maintaining a pressure of up to 12 millimeters of mercury at the surface.

Buffing Wheel

U. S. Patent 2,602,273. J. J. Lawler, assignor to Ajax Buff Co.

A buffing wheel comprising an annular cloth buff, a circular disk abutting one side surface of said buff, teeth formed integrally with said disk and extending through said buff, an annular ring abutting the opposing side surface of said buff and having peripheral apertures formed therein to receive said teeth, said teeth being deformed radially into extended surface engagement with said ring to secure said disk and ring to said buff, said teeth extending axially beyond said ring to space said wheel from an ad-

jacent wheel of a buffing assembly, and air directing vanes struck from said disk and extending generally perpendicularly with respect to the axis of rotation and at acute angles to the plane of rotation of said wheel to underlie said buff, said vanes serving to direct air radially outwardly through channels defined by said teeth spacing said wheel from an adjacent wheel into contact with said buff to cool the same and to prevent overheating thereof.

Buffing Wheel

U. S. Patent 2,602,274. J. J. Lawler, assignor to Ajax Buff Co.

A buffing wheel comprising an annular cloth buff, clamping members positioned on opposing sides of said buff adjacent the inner periphery thereof, clamping means extending through said buff from one of said clamping members and engaging said other clamping member to secure said clamping members to said buff, said other clamping member having axially extending outwardly projecting embossed portions, and said clamping means including portions lying against said embossed portions, said embossed portions and said clamping means portions lying there-against serving to separate said buffing wheel from an adjacent wheel of a buffing wheel assembly to provide heat dissipation channels between adjacent wheels when assembled.

Metallizing Plastics

U. S. Patent 2,602,757. M. S. Kantrowitz.

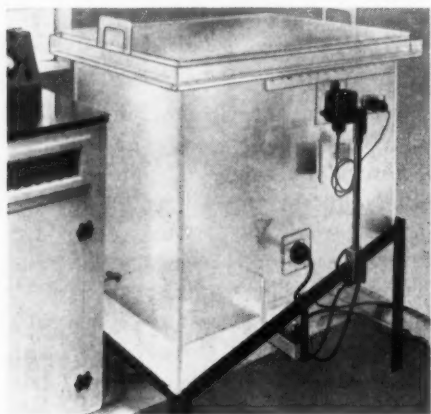
In a process for the production of an electrically conductive surface on a plastic electrotpe mold, the steps which comprise first sensitizing such a mold by treating with a lower aliphatic alcohol solution of a stannous compound and then spraying the thus-sensitized mold with an aqueous solution of silver ammonio nitrate while co-mingling with said first spray a reducer spray solution comprising an aqueous synergistic mixture of about 0.5 to 1.0% by weight of triethanolamine having admixed therewith about 0.5 to 5.0% of a lower aliphatic aldehyde selected from the group consisting of formaldehyde and glyoxal, and then continuing said comingled spray treatment until a continuous adherent bright deposit of metallic silver of electrotpe thickness is produced on said mold.

Recent Developments

New Methods, Materials and Equipment
for the Metal Finishing Industries

Salt Spray Cabinet

Singleton Co., Dept. MF, 10516
Western Ave., Cleveland, Ohio.



Seen as a major advance in electrochemical equipment is the new Singleton H-T Lucite Salt Spray Testing Cabinet for "fog-type" spray testing of all ferrous and non-ferrous metals, organic and inorganic coatings, now being introduced after 5 years of development.

Primarily designed for salt spray testing, the cabinet is said to be inert to all solutions and gases used in the complete range of "fog-type" testing, and will last indefinitely in continuous service.

According to Albert Singleton, company President, the all-welded Lucite unit, in addition to offering greater versatility and longer life at approximately half the price of other commercial types, is also many times lighter in weight for portability, transparent for observing operations, and a better insulator for maintaining accurate operating temperatures.

The standard All-Welded Lucite Salt Spray Testing Cabinet is shipped complete and ready for use. Its atomizer operates on any plant air system, and a 110-volt electric line is sufficient for its heater.

Specifications: Cabinet (36" x 24" x 36" deep I.D.); Lid (38½" x 27¼" x 3" deep I.D.); Water Seal Trough (2" wide x 3" deep I.D.); Atomizer Nozzle 8" from bottom; Glorod Heater; Specimen Support (2); Thermo-

stat 60 to 100° ± 1° F.; Solution Reservoir 7" deep; Drain Reservoir 6" deep; Fog Collectors (2); Fog Collector Stands (2); Steel Stand for Cabinet. **Total Weight:** approx. 160 lbs. The 1952 Price List and Bulletins are now available upon request.

Detergent Cleans Aluminum, Magnesium

Kelite Products, Inc., Dept. MF, 1250
North Main St., Los Angeles 12, Calif.

Rapid cleaning of aluminum, anodized aluminum and magnesium parts in power washing equipment is made possible with the development of a new detergent by Kelite Products, Inc. Known as Kelite PWB No. 81, the new detergent is a powder which is readily soluble in water. It affords complete removal of virtually all types of soil, including Reynolds, Alcoa and Kaiser ink markings, in approximately one minute. Other qualities of the new detergent: it is non-foaming, non-

corrosive, has extreme stability and long-life. Developed to the specifications of a leading aircraft manufacturer, the product is now available to the national market. Requests for complete information should be made to the manufacturer.

Plastic Floor Protection

Lankote Division, J. Landau Co.,
Dept. MF, 221 Wooster St., New York
12, N. Y.

Concrete floors can now be protected against corrosion due to acid and alkali conditions by applying Lankote 700 series coatings. These plastic coatings are also resistant to water, strong soap solutions, gasoline, etc., and can be easily applied by brush or spray.

Resistance to constant abrasion, hard wear, and shock is claimed to have proven far superior to any other paint now on the market by actual field tests. Twelve stock colors available.

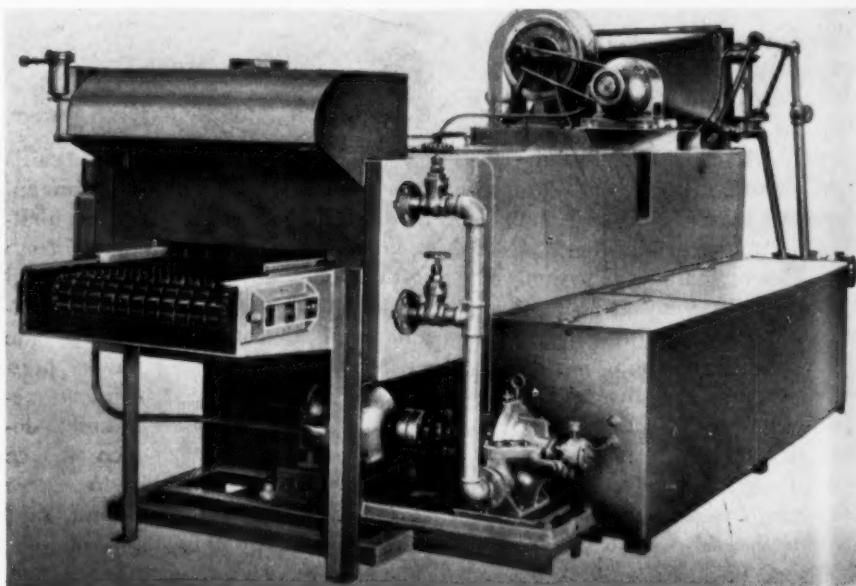
Washing Machine

The Alvey-Ferguson Co., Dept. MF,
Cincinnati 9, Ohio.

A special washing machine has been designed and engineered by this firm for one of the nation's largest automo-

bile manufacturing plants to remove grease and chips from rocker arm shafts after the machining operation.

A unique feature of this machine is the special type of A-F Bar Conveyor Unit equipped with steel discs upon which the shafts ride. The discs not



JETAL BLACK



THE **BEST** FOR **FERROUS METALS!**



EASY TO INSTALL!

EASY TO USE!

The JETAL PROCESS is a simple, inexpensive immersion method for blackening ferrous metals by oxidation.

JETAL is an attractive finish, subdued or lustrous as desired, and also an excellent base for lacquers, varnishes and other organic coatings, improving adhesion and retarding undercoat corrosion.

JETAL increases wear resistance and toughness of ferrous metals, because JETAL oxidized surfaces have increased affinity for lubricants, therefore develop less friction.

JETAL with supplemental JETOIL treatment protects against corrosion. Salt spray ratings of 25 hours are commonplace with a 5 minute JETAL treatment, 80 hours with a two-bath process.

JETAL does not affect dimensions or surface texture because it is an integral part of the metal itself.

Weld them, solder, bend, cut, punch, stamp or roll them, JETAL treated metals won't chip, scale or peel. Alkali, solvents or high temperatures can't hurt a JETAL treated surface.

The JETAL PROCESS (U. S. Patents 2077450 and 2148331) requires only one chemical — JETAL FLAKES. A mixture of alkali and oxidizing agent carefully balanced to provide fool-proof blackening.

JETAL MEETS U. S. ARMY SPECIFICATIONS — 57-0-2C FOR TYPE 3 FINISH. Have your steel samples JETALIZED without cost — or have a JETAL demonstration in your own plant on request.

JETAL-TREAT THESE PARTS FOR JET BLACK PROTECTION

Aircraft parts, automobile parts, axles, bearings, bits, bolts, bottle caps, box strapping, buttons, bushings, carburetors, cutting tools, cutlery, die drills, engines, fans, farm implements, firearms, gaskets, gauges, nuts, nails, needles, printing machinery, screws, springs, valves, washers, etc.

JETAL Cost Estimate:
Only \$1.00 for chemicals per thousand square feet of flat surface!

Examples of parts treated: hinges, locks, magnets, nuts, clips, instruments, machinery, propellers, pumps, scales, screws, scissors, sewing machines, steel furniture, typewriters, toys, staples, tacks, tubing, sheet steel, vacuum cleaners, radio parts, household appliances, telephone parts, wire products, cartridges, shells, farm implements, gauges, screws, printing machinery, hardware.

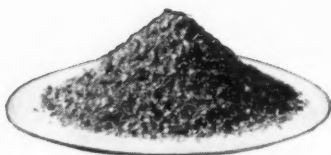
ALROSE CHEMICAL CO. PROVIDENCE, RHODE ISLAND • Wl liams 1-3000

METAL FINISHING, September, 1952

Better finishing in sight for You!



SIMONDS ABRASIVE CO. **Abrasive Grain**



Look to Simonds Abrasive Company Borolon and Electrolon grain for the utmost in efficiency and economy. These are the same accurately sized, top quality grain used in making Simonds grinding wheels, mounted wheels, points and segments. Free data book describes Simonds tough, sharp, free cutting Borolon and Electrolon grain in accurate sizes for your jobs.

Send for free data book and name of your distributor.

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DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

only hold the shafts in place as the conveyor moves through the machine but also provide minimum points of contact so the maximum surface of the shafts is exposed for fast, efficient washing and drying.

Like all other A-F Washing Machines for Industry, this machine utilizes the A-F Super-Spray Cleaning System. The shafts pass through consecutive high-pressure, fan-shaped curtains of cleaning solution from above, below and both sides. A hot blow-off unit is used for drying.

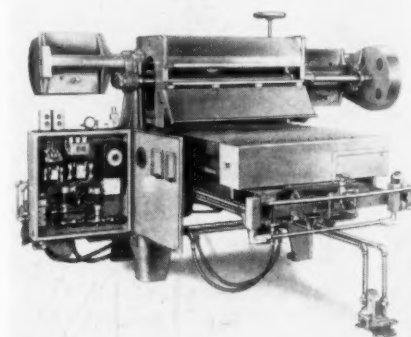
Like all other A-F Washing Machines this machine is equipped with a Screen Tank having two screens so that one screen at a time can be removed for cleaning without interrupting operation of the machine. As the name implies, the Screen Tank screens out foreign particles from the cleaning solution and thus prevents the nozzles from becoming clogged.

Surface Finishing Machine

Clair Manufacturing Co., Inc., Dept. MF, 1009 South Union St., Olean, N.Y.

A modification of the Clair Model 203 Surface Finishing Machine has been introduced by the above manufacturer. Designated the Model 203-A, this machine was developed specifically for surface finishing formed decorative name plates for refrigerators, stoves, appliances and automobile trim.

Through a vacuum chuck arrangement, the Model 203-A will handle name plates made of brass, copper, silver, plastic aluminum, wood and other non-magnetic materials. The



manufacturer stresses that even small items can be held and surface finished without interference with coverage over the entire surface.

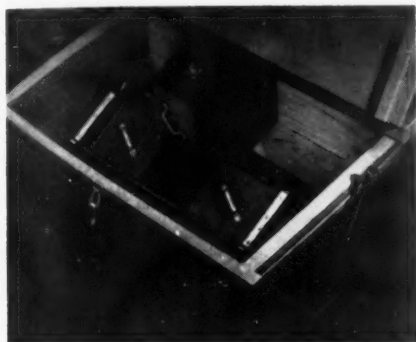
An improved feature of this modified unit is the fact that all controls have been assembled at a central control panel. The control panel is contained in a strong metal case, located where it is not exposed to abrasion

from the polishing compound. Motors are available in varying speeds up to 15 horsepower in size. Buffs used on this machine ordinarily are 9" in diameter, but can be increased to 12" in diameter if desired.

The work table consists of a perforated plate mounted over a sealed air space, this space connected to a vacuum pump through a 4-way spring valve. Standard work table size is 36" deep by 38" wide, but it can be built up to 48" x 38" if required. This table has both "in and out" and "sideways" strokes. "In and out" stroke is adjustable from $\frac{3}{4}$ " to 36"; "sideways" stroke from $\frac{1}{2}$ " to 13 $\frac{1}{4}$ ".

"Pocket Tumblers" for Small Parts

Tumb-L-Matic, Inc., Dept. MF, 4510 Bullard Ave., New York 70, N. Y.



This firm announces a new tumbling barrel having individual "pockets" for tumbling from 2 to 6 items at a time. The "Pocket Tumbler" is recommended for deburring, precision finishing and polishing small metal and plastic parts.

Typical items for which the tumblers can be used include jewelry findings, ornaments, stampings, screw-machine parts, gears, etc. Jewelers, experimental laboratories and instrument manufacturers are typical users.

The tumbler comprises a rotating container, or "frame," into which the pockets fit. Both the pockets and the frame are hexagon-shaped. The frame is enclosed on five sides during tumbling to hold the pockets in. One side of the frame opens to permit pockets to be inserted and removed.

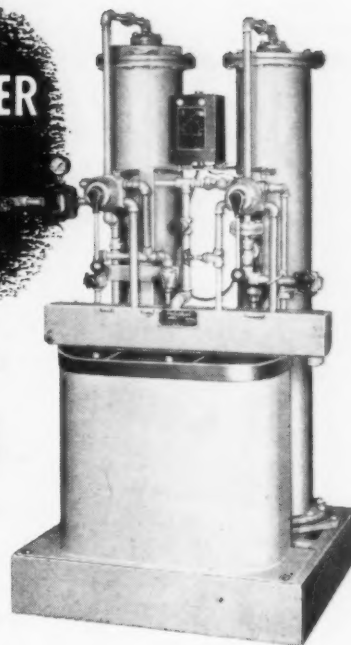
Pockets are equipped with handles for ease of handling. They open on the side adjacent to the handle. By having an extra supply of pockets, loading and unloading can be accomplished while other pockets are being tumbled and a near continuous batch operation can be achieved. Tumblers are avail-

CHEMICALLY PURE WATER *is Cheap*

only a few cents a thousand gallons

with **INDUSTRIAL** Water Demineralizers

A two-bed INDUSTRIAL demineralizer unit. Standard units are available with capacities of 200 to 1000 gph. Special units of any capacity are engineered to requirements.



Eliminate

UNWANTED PRECIPITATES
HOT WATER RINSE STAINS

These two difficulties in plating can be eliminated with one stroke—chemically pure water. Pure water in plating solutions improves the over-all quality of plated coatings. The use of pure water for hot rinses prevents stains and water marks after drying. With an INDUSTRIAL demineralizer chemically pure water costs so little that the unit pays for itself in a short time. It's easy to install and operate, and requires very little floor space.

Write for Bulletin 200

or send us a water analysis, letting us know the amount of treated water required in gallons per hour, and whether intermittent or continuous flow is needed. We will then give you the whole demineralizer story, including estimated cost, equipment required, performance data, etc. for your requirements.



for solution clarification . . .

INDUSTRIAL Filters

A typical INDUSTRIAL stationary filter. Standard portable and stationary models are available with capacities 100 to 15,000 gph. Special filtering systems are engineered to meet unusual requirements.



Write for Full Information and Recommendations

INDUSTRIAL FILTER & PUMP MFG. CO.

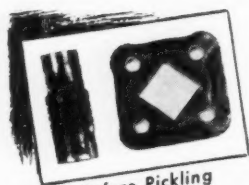
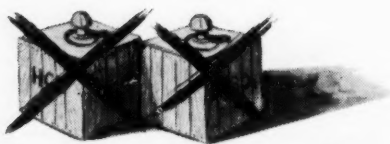
5906 Ogden Avenue
Chicago 50, Illinois

FILTERS PUMPS CORROSION TESTING APPARATUS
Pressure Type Centrifugal Salt Fog • Humidity

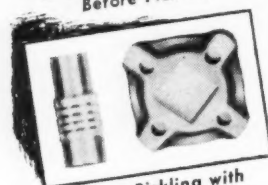
RUBBER DIVISION
Vulcanized Linings • Molded Products

WATER
DEMINERALIZERS

Cut Out the Mineral Acid Hazard... and get Better Descaling and Derusting!



Before Pickling



After Pickling with Magnus D-Scale-RS

USE A SAFE MATERIAL that won't attack either the metal parts being treated or the metal of the equipment. Use a material that doesn't give off fumes... that is safe for your workers to handle, and is safe in storage. Use Magnus D-Scale-RS, the inhibited crystalline acid for derusting and descaling.

Inert Until Dissolved in Water

D-Scale-RS is chemically inactive until dissolved in water. Then it becomes a highly effective pickling acid that does a better job than mineral acids. It readily attacks rust and scale, but its built-in inhibition against attack on metals prevents excessive acid action, so often encountered when ordinary acids are used. It can be used in either hot or cold solution.

prevents excessive acid action, so often encountered when ordinary acids are used. It can be used in either hot or cold solution.

Use in Barrels or Tanks

Magnus D-Scale-RS can be used in barrels for descaling and derusting, as well as in tanks of any size.

WRITE FOR BULLETIN 36 if you are interested in new standards of safety in pickling.

MAGNUS CHEMICAL CO. • 11 South Ave., Garwood, N. J.
In Canada — Magnus Chemicals, Ltd., Montreal.
Service representatives in principal cities.



MAGNUS

CLEANERS • EQUIPMENT • METHODS

able with frames for handling from 2 to 6 pockets. Pockets range from 12 to 16 inches in diameter.

The Pocket Tumbler shown is the submerged type for wet tumbling. The outer box-container holds water during tumbling. Also available is the self-contained type which can be adapted for either wet or dry operation. This type does not have the outer box-container but water can be added into the individual pockets when desired. In the self-contained design, wet and dry process barrels can, of course, be operated at the same time.

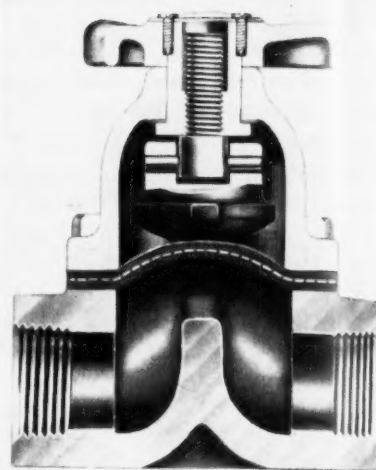
The removable pockets operating in a single frame enable the user to attain a high degree of interchangeability with a single piece of equip-

ment. The equipment is suitable for all methods of tumbling by simply adding the recommended abrasive in any given pocket for the process to be carried out. The units can be furnished with variable speed drives which further increases their versatility.

Diaphragm Valves

American Hard Rubber Co., Dept. MF, 93 Worth St., New York 13, N. Y.

Combining corrosion resistance with the efficient Saunders diaphragm principle, the above company, specialists in corrosion-resistant equipment since the birth of the chemical industry, offers these new general-purpose diaphragm valves which are said to be



ideal for handling a wide variety of corrosive chemicals.

Metal never comes in contact with the liquids handled. The valve body is molded of Ace Parian, a plastic compound in the polyethylene family. The diaphragm may be rubber, Neoprene, or polyethylene, as required. The bonnet assembly is sealed off from the solution, and the valve has no stuffing box to leak. It can be serviced without removing from the line, and all parts are interchangeable.

The new valves are available in all standard sizes from 1/2" to 2", threaded for standard pipe threads. Its working pressure is 50 lbs. per sq. in. at 77 deg.F.

Liquid Steam Cleaning Compound

Turco Products, Inc., Dept. MF, 832 East 62nd St., Los Angeles 1, Calif.

A free rinsing, readily soluble liquid steam cleaning compound, which is safe on reactive metals and painted surfaces, is the most recent development of this manufacturer. Non-hazardous, non-flammable Turco 3232 which is stated to afford efficient, speedy, economical removal of light to medium soil deposits, is very free rinsing. It will leave no white streaks or solution residues on surfaces. Its emulsifying action enables oil and grease-bound dirt to be freely rinsed away. Since it is liquid, it goes into solution more easily than powdered materials. Furthermore, it is stable and will not settle out.

The compound gives scale-free operation, except in the very hardest of water. It lubricates check valves, pumps and coils, lightening the physical effort of cleaning and eliminating non-mechanically caused steam gun kick and sputter. Thus, it protects equipment

and minimizes "down time" occasioned by scaling in coils.

Turco 3232 emits no disagreeable fumes or objectionable odors. The active, soapless lather gives the operator visual control of compound strength. He does not wastefully overcharge his machine.

Turco 3232 meets the corrosion requirements of Air Force Specification 14128a as non-corrosive to aluminum alloys, anodizing and reactive metals. The material has been tested and approved for use by Air Materiel Command, Wright Field.

Industrial Clothing

Chem-Wear, Inc., Dept. MF, 1 Boston Post Rd., Darien, Conn.

A new line of Dynel industrial clothing in subdued color patterns, claimed to outlast most similar garments in use today, is announced by this manufacturer of chemical-resistant fabric clothing.

Made from a newly developed fabric known as "Chem-Weave," which employs special weaving and processing of Dynel yarns, the result is stronger, lighter-weight industrial garments. This fabric tests considerably stronger than cotton and is among the strongest of existing synthetics.

One of the principal advantages claimed for the new Dynel clothing is that of increased wearing comfort. "Chem-Weave" has an unusually high factor of air flow, testing considerably better than former fabrics of chemically resistant yarns.

The new "Chem-Weave" garments are a mottled, gray shade, a tone devised for use in chemical operations. This gray shade hides staining, resists discoloration and keeps the garments looking serviceable longer. The garments will withstand repeated industrial launderings. They dry smoothly



FOR THIN, NON-POROUS, FAST-SETTING,
ACID AND ALKALI RESISTANT
MORTAR JOINTS



use

DURISITE CEMENT

DURISITE is the furane based cement that gives you better constructed, more versatile, longer lasting, corrosion-resistant masonry. It's the cement that resists weak and strong acids, weak and strong alkalis, and all solvents. It's the cement that handles acids and alkalis alternately. It's the cement that gives you the tightly-bonded, extra-thin joints that are so all-important to a rugged floor or sturdy tank lining.

What's more, Durisite is quick-setting and chemical hardening. It's dense and non-porous with a water absorption of less than 1/2 of 1%. It has high compressive strength. It's non-toxic. And, it can be stored indefinitely, without deterioration.

If you're planning some corrosion-resistant masonry, be sure to use Durisite. It's the means to the end of expensive maintenance, repair, or premature failure. Write, today, for full information.

494C

THE U. S. STONEWARE CO.
AKRON 9, OHIO
PROCESS EQUIPMENT DIVISION

unwrinkled, saving the expense of ironing. The new Dynel clothes are expected to set new standards of wear-life and effect substantial operating economies in plants, shops, service stations, etc., where workers handle corrosive chemicals.

Black Finish

Parker Rust Proof Co., Dept. MF, Detroit 11, Mich.

A new jet black finish for iron and steel, claimed to have ten times the corrosion resistance of conventional blacks, has been developed by this company. It is now available under the trade name "Parco Black."

This new product is used in water solution at low temperatures. Parts to be treated are immersed for 15 to 30 minutes in the processing bath, then are rinsed and dried. After oiling or waxing, the deep black, durable finish is ready for service.

Advantages of Parco Black are stated to be several. The processing bath is non-caustic, extremely simple to build and easy to control. Operating temperatures are much lower than those required for other widely used "black" processes. Any part which can be immersed in the Parco Black tank can be treated. It is entirely suitable for machined or threaded parts.

Can you afford to buy a low-priced plating filter?

In many instances the first cost of a Sparkler filter will exceed that of some other types of plating filters.

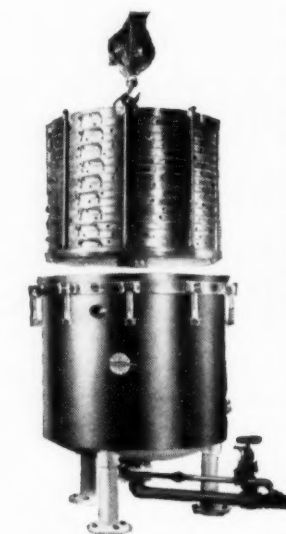
But the savings in operating cost soon will more than make up for the difference, and you will find your Sparkler a good investment both on the basis of cost and quality of performance.

For example:

- ★ Pre-coating Sparkler horizontal filter plates requires only about one-third the amount of filter aid used by some other filters.
- ★ Only a thin pre-coat is necessary, and you can get brilliant sharp clarity right from the start.
- ★ Intermittent operation of the filter will not break up the cake on horizontal plates. No renewal of pre-coating is necessary after a period of inactivity.
- ★ A wide range of fineness of filter media is possible with Sparkler filters.
- ★ Sparkler filters are ideal for alloy plating solutions. Non-metallic filter plates and rubber lined tanks are available when required.

These are a few of the many operating advantages that make Sparkler plating filters the most economical in labor and material cost and most satisfactory from a standpoint of filtering quality.

Sparkler representatives in all principal cities are available for personal service on your filtering problems.



An extra set of plates that can be changed in a matter of minutes cuts "down-time" to a minimum.

SPARKLER MANUFACTURING CO.

Mundelein, Illinois

Sparkler International Ltd.
Herengracht 568, Amsterdam, Holland

Kamitter & Co.
35 Chittaranjan Ave., Calcutta 12, India

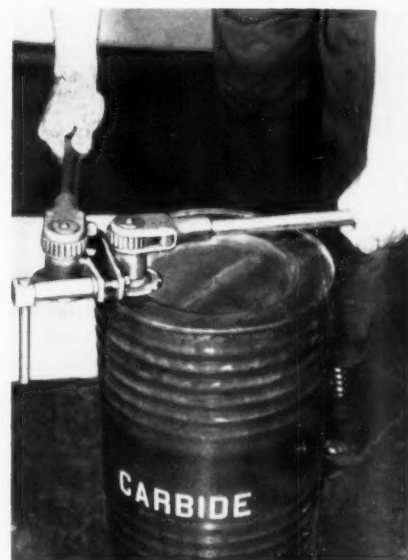
Sparkler Western Hemisphere Corp.
Mundelein, Ill., U.S.A.

Drum Head Cutter

Michael A. Schinker Mfg. Co., Dept. MF, 6514 S. Western Ave., Chicago 36, Ill.

This company announces a new speedy, light weight, hand operated Head Cutter called the Model 600. It was especially designed to cut out the tops of heads of Carbide, Caustic Soda, Cyanide, Resin, Tar, Pitch, Falke and other "one-time-shipper" drums and cans of 24 to 30 gauge metal.

The principal feature of this cutter is that after the cut is completed the container will have a safe, "turned-in" flange which permits its use for many purposes. Secondary port hole covers within the head offer no difficulty.



The hazard of poisonous or irritating dust conditions due to agitating the contents of drums with noisy hammer and chisel method is claimed to be eliminated.

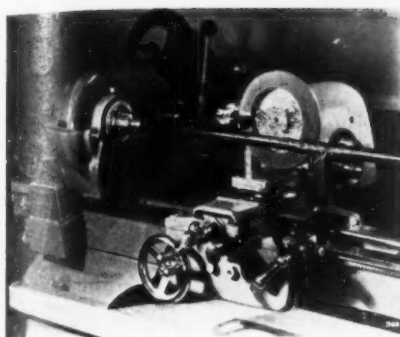
Traction is obtained through 2 drive shafts mounted in bronze bearings. Cutting and roller wheels are 3" diameter. Weight only 12 lbs.

Full details may be had by writing the manufacturer at the above address.

Abrasion Tester for Cylindrical Parts

Taber Instrument Corp., Dept. MF, 111 Goundry St., North Tonawanda, N. Y.

This firm has announced a new abrasion testing machine for rating the wear resistance of protective finishes, i.e. black oxidized or electroplated coatings, extruded plastic and enamel applied to aircraft, ordnance and metal furniture tubing and other cylindrical parts or test pieces.

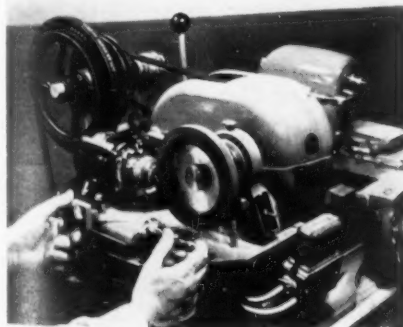


A

Illustration "A" shows a 34" rifle barrel being tested to determine the amount of wear from handling the metal part will withstand before the blue oxide finish is worn thin, resulting in corrosion of the part.

The test is performed by placing the gun barrel between two driving centers with the test surface in contact with the abrading head. This abrading head can be adjusted lengthwise of the barrel to any position within its range. Pressure of the abradant against the test surface is applied by a floating dead weight load system, which compensates for minor inaccuracies of the test part. The resulting wear is comparable to a gun being handled under field service conditions.

This Model No. W-3981 Cylinder Abrasion Tester is fully adjustable to take cylindrical specimens from $\frac{1}{2}$ " to 6" in diameter and 8" to 36" in length. The width of the wear track is normally 1", however, the face of the abrading medium can be narrowed to wear a track only $\frac{1}{2}$ " in width, where required. The abrasion resistance is reported as "the number of wear cycles" the surface will withstand before penetration of the protective finish permits corrosion to take place. The end point for corrosion resistance is determined with an indicator solution, however, a visual end point can also be used by comparing with a standard. The wear cycles are indicated by an electric counter at the left of the operator. One wear cycle



B

Are you SURE you're using THE MOST EFFICIENT FINISH?

If your production involves
finishing zinc, cadmium,
aluminum or cuprous metals,
you owe it to yourself...
and your customers...
to investigate

IRIDITE®

for on any of these metals Iridite gives you a high performance finish at a low cost from a simple chemical dip.

IF YOU WANT HIGH CORROSION RESISTANCE,
you'll find an Iridite that will meet any military or civilian specifications for chromate finishing.

IF PAINT ADHERENCE IS IMPORTANT,
you'll find Iridite prevents underfilm corrosion and soap formation.

OR, FOR BRIGHT, DECORATIVE FINISHES—

investigate zinc plate and Iridite (Bright) for a chrome-like decorative finish with more corrosion protection than conventional chrome plating... or Iridite (Metcote) as a treatment for copper that eliminates the need for buffing in the copper-chrome system; produces a sparkling bright finish!

Write for literature and send us samples for test processing. See "Plating Supplies" in your classified telephone directory or write direct.

Iridite is approved under government specifications.

ALLIED RESEARCH PRODUCTS INCORPORATED

4004-06 E. MONUMENT STREET • BALTIMORE 5, MD.



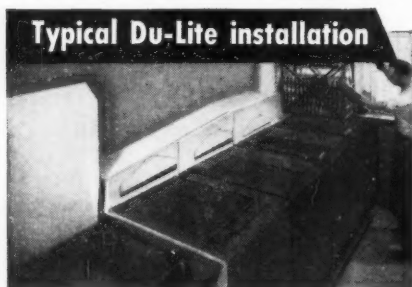
Manufacturers of Iridite Finishes
for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Brighteners.
West Coast Licensees: L. H. BUTCHER COMPANY

On any steel blackening problem
DEPEND on DU-LITE
for a Superior Finish



Courtesy The Poly Choke Co.

Du-Lite gave this part with its complicated knurls, slots, threads, etc. a fine rust-resistant durable black finish. It is typical of many other parts, small and large, which have been black oxidized by Du-Lite for many years. Moreover, Du-Lite meets most individual and government specifications including 57-0-2C for Type III Black Oxide finish.



Du-Lite installations are simple, compact, easy to operate. Du-Lite equipment can be tailored to fit production requirements on all types of jobs with a maximum of speed and economy. Du-Lite also makes a complete line of cleaners, strippers, wetting agents, passivating agents, rust preventatives, burnishing compounds etc. for any metal finishing application.

See your nearest Du-Lite Field Engineer
or write for more information.

DU-LITE CHEMICAL CORP.
MIDDLETOWN, CONN.

Rush information on your metal
finishing products.

Name.....
Company.....
Address.....
City..... Zone..... State.....



is one complete revolution of the abradant wheel.

A refacer for the abradant is located at the left of the driving head, as shown in photograph "B". It consists of a motor driven refacing wheel and a mounting on the main spindle shaft to receive the abradant wheel. The main spindle turns the Calibrase Wheel while the motor driven abrasive wheel is moved across the face of the abradant by means of a hand feed screw.

**Outside Exhaust and Drive for
Low Frequency Power**

Aget-Detroit Co., Dept. MF, Ann Arbor, Mich.

Added to its line of industrial dust and vapor collectors by manufacturer is the Model 30ND50 Dustkop dust collector which provides for outside exhaust of cleaned air, together with an over drive when used on electric power having frequencies of less than 60 cycles.

Having a rated capacity of 3,630 c.f.m. at 6" static suction on an 8" diameter pipe, the Model 30ND50 fulfills the requirements of certain state codes which make mandatory the outside exhaust of cleaned air from any dust source. The unit employs a standard size, pre-tested, cyclone separator, which removes the dust and dirt from the air and permits the discharge of the cleaned air, together with any toxic or objectionable fumes, to the out-of-doors. A dust storage capacity of 12 cu. ft. is standard and is considered ample for most industrial dust collecting installations. Access to the dust compartment is by doors at either end. Where the unit is to be used for woodworking operations or other dust collecting jobs involving very large amounts of collected dust, the unit can be supplied with either an extension, or with a hopper bottom.

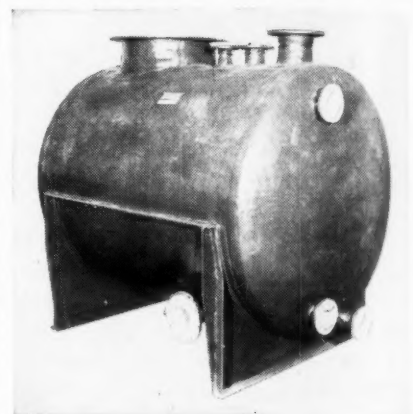
Supplied as standard equipment is a 5 h.p. motor, for operation on either 220 or 440 volt, 3 phase, 60 cycle power, together with manual starting switch which has thermal overload protection.

The unit, which is shipped complete, requiring no assembly at destination, is recommended for grinding, buffing or polishing wheels, surface grinders, woodworking machines, etc.

Shipment of the unit, according to the company, is from stock to facilitate speedy control of troublesome dust sources.

IMPORTANT USE
for
PLA-TANK[®]

Resin-Bonded Fiberglass Material



**Chemical and Laboratory
Waste Treatment Tanks
and Corrosion-Resistant
Drain-Pipe**

The 500-gal. tank shown here is part of such a system, holding corrosive liquid waste and aerating it during treatment before discharge.

PLA-TANK material is ideal for such uses. It is strong, yet light weight. Its thin wall section is molded into almost any shape. Connections may be integrally formed at any point. The chemical resistance of its polyester resin and Fiberglass is ideal for most waste disposal products. Deliveries are good, cost is competitive with or lower than other suitable materials.

In electro-plating shops or chemical plants where drain-pipe corrosion is a problem, PLA-TANK pipe from 2"-48" can help you.

Before you order any corrosion-resistant material for TANKS, DRAIN-PIPE, FUME DUCT or VENT HOODS, send us a sketch for free quotation and recommendations using PLA-TANK.



Safety Solvents

Tect, Inc., Dept. MF, 556 Grand Ave., Englewood, N. J.

A complete series of Safety Solvents replacing carbon tetrachloride are now available in volume quantities, it was announced recently by this producer. Offered under the trade name "Tecsols," 10 different solvents can now be supplied for a great variety of uses in manufacturing, processing, and plant maintenance.

The need for the safety solvents has been emphasized by recent action of the New York City Board of Health in regulating the sale of carbon tetrachloride. Alarmed by the many deaths and injuries caused by carbon tetrachloride, the municipal board has amended the Sanitary Code to require a warning label on any product containing carbon tetrachloride. (Tecsols contain no carbon tetrachloride.)

Low in toxicity, these solvents may be used with vapor concentrations in the air 8 to 20 times greater than permissible with carbon tetrachloride. In addition, these versatile materials do not have a cumulative effect on the human system comparable to that of carbon tetrachloride.

Some of the solvents are completely non-flammable; others will burn only with difficulty. Replacing carbon tetrachloride in 95% of all applications, Tecsols are finding widespread use for metal cleaning, plant and electric motor maintenance, wax dispersion and removal, and in hundreds of special applications.

First introduced in the summer of 1950, Tecsols have gained steadily in popularity, especially among plant personnel and safety engineers. Health hazards have been greatly reduced. Users have found, too, that these solvents have little or no tendency to attack finished surfaces, natural or synthetic rubber, plastics, or insulated wire.

Electronic Temperature Controller

Thermo Electric Co., Inc., Dept. MF, Fair Lawn, N. J.

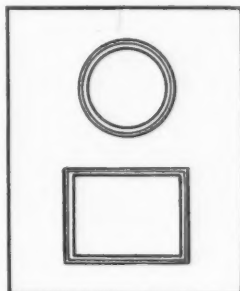
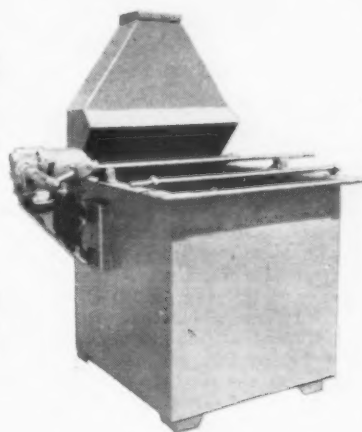
For accurately controlling operating temperatures ranging from minus 100°F. to plus 600°F., the above company is introducing their newly designed "Thermo Electronic" Temperature Controllers using Resistance Bulb Sensitive Elements. They are built with single or duplex control action, avail-

HERE'S HOW YOU CAN SATISFY YOUR HOOD AND DUCT REQUIREMENTS *in a hurry!*

Specify the New Heil Solid Plastic Hoods and Ducts for the Ultimate in Protection. Built by makers of Chemical-Proof Equipment.

SOLID PLASTIC HOODS

1. **Low Initial Cost.** Complete standardization and know-how results in lower cost to you.
2. **Acid Protection Inside And Out.** No need to worry about bumps and scratches — made of solid plastic.
3. **Wide Variety of Standard Design.** Can be made up to 6 feet long in standard units — all designs in accordance with American Standards Association.



SOLID PLASTIC DUCTS

1. **Either Round or Rectangular.** Easy to Replace your present system.
2. **Light Weight and High Strength.** Easy to Install.
3. **Excellent Chemical and Heat Resistance.**

• You are Assured Long Service Life When you Specify Heil

Products of Heil Process Equipment Corp. are sold by all leading Electroplating Jobbers.

WRITE TODAY
FOR BULLETINS
#751 and 754
Describing Heil Solid Plastic
Hoods and Ducts.

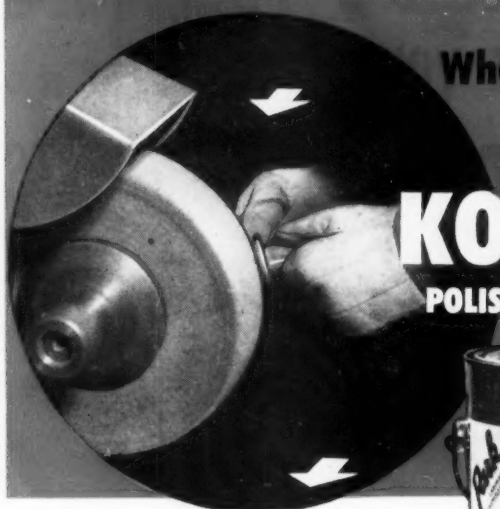
HEIL PROCESS EQUIPMENT CORP.

12901 ELMWOOD AVE.

CLEVELAND 11, OHIO

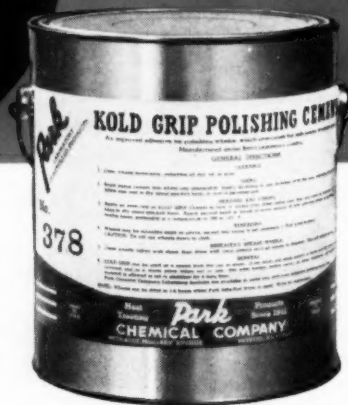
Other Heil Products Include: Lead Anodes • Tanks Lined with Rubber • Koroseal • Saran Rubber • Lead • Nicordal Impervious Graphite Heating Units • Lined Drums • Lead Fabrication • Acid-Proof Maintenance Materials

Wheels CUT FASTER, LAST LONGER



When treated with

Park
KOLD-GRIP
POLISHING WHEEL CEMENT



KOLD-GRIP Polishing Wheel Cement, laboratory-controlled through every step of production, will arrive at your plant ready for use! Viscosity is constant, regardless of normal temperature variations and the cement can be applied directly from the container . . . *without mixing or heating*. Kold-Grip is clean, odorless and very easy to handle.

Coarse or fine-grain abrasives set up right for fast cutting efficiency. Substantial savings are effected through longer over-all wheel life, fewer setups and reduced wheel inventory.

Wheels dry rapidly, are unaffected by humidity changes, and may be stored in any convenient plant area.

Let our polishing engineer demonstrate Kold-Grip for you, or send for free sample, telling us the metal to be polished, grain sizes to be used, and drying facilities available. We can help you if we hear from you.

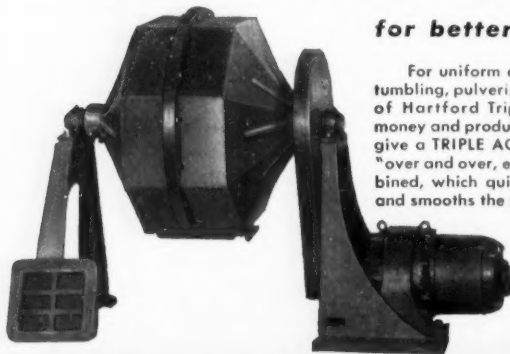


• Liquid and Solid Carburizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Weybridge, Surrey, England

HARTFORD TRIPLE ACTION CUTTING and TUMBLING BARRELS

for better work in less time!



For uniform cutting down, wet or dry grinding, tumbling, pulverizing and mixing, the unique design of Hartford Triple Action Barrels saves time and money and produces better results. Hartford Barrels give a TRIPLE ACTION in tumbling the material, an "over and over, end to end, folding-in" motion combined, which quickly grinds off burrs, and finishes and smooths the general surface of any article in the load. These barrels are available in two sizes, large and small, and with both motor and belt drive. Hartford also makes steel burnishing balls scientifically correct in design and material for each specific job. Bulletin on request.

THE HARTFORD STEEL BALL CO.
HARTFORD 6, CONN.

DETROIT
W. S. TURNER
445 NEW CENTER BLDG.

CHICAGO
VICTOR R. CLARK
605 W. WASHINGTON BLVD.

NEWARK, N. J.
GUARANTEE TRUST BLDG.
972 BROAD ST.

LOS ANGELES, CAL.
E. D. MALBY CO.
1710 SOUTH FLOWER ST.

EXPORT
R. A. RODRIGUEZ, INC.
55 W. 42ND ST., NEW YORK

2H582



able in six different temperature ranges. The standard Resistance Bulbs, designed for use with these controllers, cover practically all process applications. The instrument has a relay with load contacts for operating heating elements, motor starters, electric valves, and signal contacts for the two red and green lights on the instrument door. These signal lights are boldly visible over a wide angle at distances up to 100 feet.

New Cold Galvanizing Process

Galvanite Corp., Dept. MF, 40 West 29th St., New York 1, N. Y.

After two years of extensive testing, an entirely new method of cold galvanizing for surface protection of steel and iron has been announced by H. L. Grebinar, of the above firm.

This compound may be applied with any ordinary paint brush, electric spray gun or by cold dip. Special equipment or personnel training is unnecessary.

"Galvanite" is stated to differ basically from other so-called metallic paints containing zinc, in that it actually combines with the base metal, setting up electrical continuity and offering true cathodic protection. It leaves a coating of 96 parts, by weight, of chemically pure zinc. This important advantage will be appreciated by users of other surface protection methods which utilize zinc or aluminum dust.

In instances where the product is directly applied onto adhering rust, it is claimed to induce the rusted area to create its own non-flaking coating, thereby stopping any further rust and preventing "rust creep." It also eliminates the costly time-consuming and often impractical necessity of de-

mantling required by other zinc galvanizers, since it can be applied directly to the object, regardless of size. A single coating of brushing consistency will give a coverage of approximately 625 square feet per gallon.

Within 40 minutes after application, it will be tack-free and will be completely dry for use within 48 hours. The dried film contains nothing injurious to health.

"Galvanite" is available in cans in four sizes, 1/2 pint, quart, one gallon and two gallon, which cost respectively \$2.10, \$7.75, \$26.00, and \$51.50. Special reductions in larger quantities.

For spraying "Galvanite" Solvent is used, which will double the coverage area of "Galvanite" compound, and is available at \$.40 for the 1/2 pint, \$1.00 for the quart can, and \$1.75 in the gallon can size.

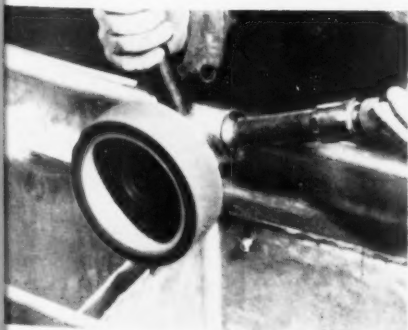
Drum Sander

American Diamond Saw Sales, Dept. MF, 120 N. W. Ninth Ave., Portland 9, Ore.

An 8" diameter by 2" wide, light weight Cone-Loc Drum Sander is now available, according to announcement from this firm. This new size fills in the gap in diameters that previously existed. Other diameters available are 6 1/4", 10", 12" and 16".

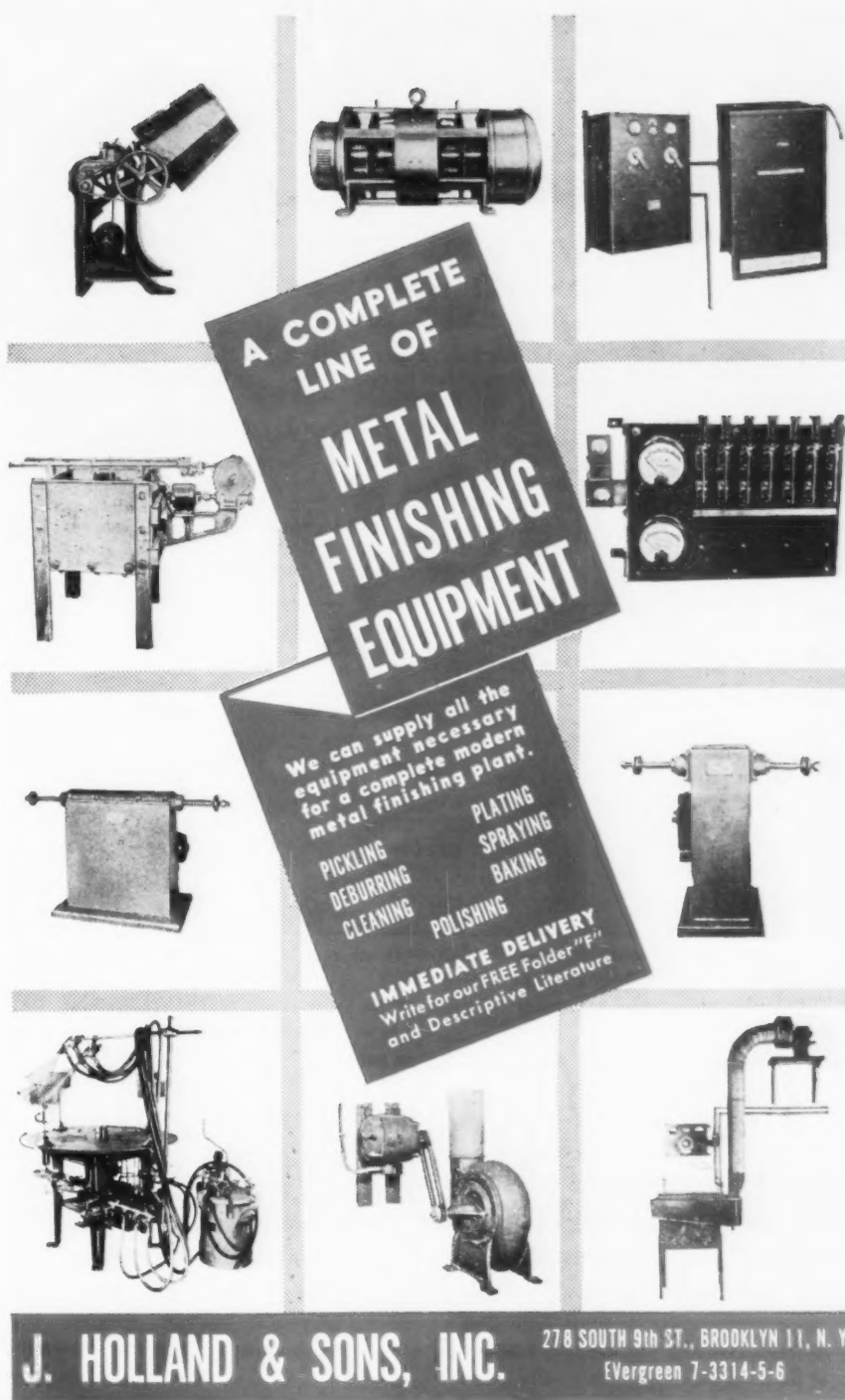
The new 8" diameter sander, operating at speeds around 3500 r.p.m., provides over 7000 surface feet per minute cutting speed with coated abrasives. The tool weighs only 3 1/2 pounds and can be used satisfactorily with portable grinding equipment.

The Cone-Loc Drum Sander is a split drum type sander that permits the use of strips of coated abrasives and eliminates the need for the more costly endless belts. It is a balanced,



precision tool and operates smoothly at speeds up to 5000 r.p.m. according to claim from the manufacturer.

Complete details can be obtained from any office of The Carborundum Company.



A COMPLETE LINE OF METAL FINISHING EQUIPMENT

We can supply all the equipment necessary for a complete modern metal finishing plant.

PICKLING
DEBURRING
CLEANING

PLATING
SPRAYING
BAKING

IMMEDIATE DELIVERY
Write for our FREE Folder "F" and Descriptive Literature

J. HOLLAND & SONS, INC. 278 SOUTH 9th ST., BROOKLYN 11, N. Y.
EVergreen 7-3314-5-6

Liquid Phase Metal Dry Degreaser

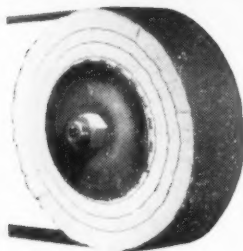
The Curran Ordnance Chemical Laboratory, Dept. MF, Lawrence, Mass.

This firm has developed a high-performance metal degreaser under the name of Flo. Technically, this is a Flowlene degreasing solvent. This new clean-drying safety solvent is for rapid solvent dry degreasing of parts and engine accessories and is especially adapted for cleaning electrical accessories. The product Flo contains diethyleneglycolmonoethylether. The new

solvent is said to be relatively odorless, is easy to handle, and is safe for use in all types of equipment designed for liquid phase solvents . . . does not tend to de-fat the skin and is clean to use . . . dries quickly, without leaving any film or sticky residue.

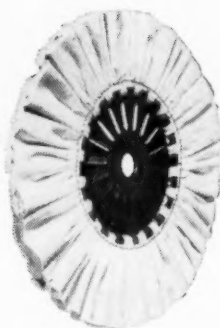
Because of its unusually low cost, as a bulk chemical Flo will be sold for the time being only in 50 gallon size drums. According to Mr. A. F. Curran, Director of Research and Development for the Curran Corporation, the new solvent is especially formulated for use in recirculation

A FEW OF THE MANY FORMAX PRODUCTS



STYLE C-20 CONTACT WHEELS and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive felt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.



ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth or sisal mounted on safe steel centers. Available in a wide range of densities and center diameters.



A complete line of buffing compounds in bar form as well as in liquid form for brush or spray application. Also Flex-A-Glu polishing wheel cements.

Our Laboratory and Sales Engineering staff would welcome the opportunity to be of help in solving your finishing problems.

Send for descriptive literature

FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

"THE FOUR McALEERS"

MANUFACTURED IN CANADA BY JOHN GALLOWAY LTD., KITCHENER, ONT.

solvent degreasing machines employing a flow of solvents over the parts while they are being brushed. High cutting action and quick, clean evaporation assures high performance. According to the chemical laboratory, the product is said to be non-corrosive and harmless to all makes and types of liquid phase solvent recirculation machines. For further information, write to the above firm.

Flowmeter

Minneapolis - Honeywell Regulator Co., Industrial Division, Dept. MF, 4494 Wayne Ave., Philadelphia 49, Pa.

Accurate measurement of flow of liquids and gas under difficult conditions is made possible by the develop-

ment of a new, improved flowmeter. The new unit is capable of handling toxic or highly corrosive substances, viscous liquids or other fluids under pressures up to 20,000 psi and temperatures ranging from -269°C to 1200 degrees F.

The meter was developed by Potter Aeronautical Co. originally for aeronautical test and research. This instrument, recently improved in cooperation with the above firm, permits all parts, except the sensing element, to be enclosed in a Brown Electronic potentiometer. The device is being marketed as the Potter-Brown flowmeter.

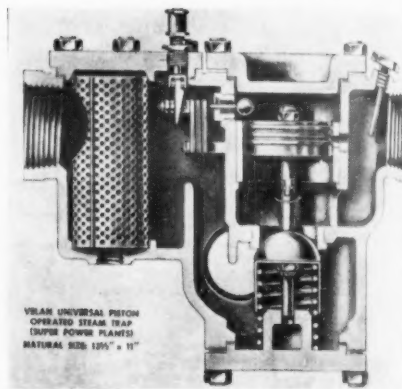
The new device can be used for laboratory work as well as for indus-

trial flow and automatic control applications. It is particularly adapted for use in the current development of petro-chemicals and hydrogenated coal-tar-chemicals. Further information may be obtained by writing to the company at the above address.

Steam Trap

Velan Engineering Co., Dept. MF, 1 Exchange Place, Jersey City, N. J.

The above firm has announced their new type SP piston operated steam trap for applications where exceptionally large capacities are required.



This new trap being comparatively small and 3 to 10 times lighter than other designs of similar piston-operated traps has a 2" orifice with tremendous capacities. The air-discharge capacity is enormous and much larger than that of other designs. All moving parts are made from stainless steel including piston plunger, piston liner and spring. The strainer is made from heavy duty phosphor screen for pressures up to 250 p.s.i. and from stainless steel for higher pressures. The trap can be supplied with screwed connections 1½", 2, 2½", 3" or with flanged connections 1½" to 5". Further information may be obtained by writing to the company at the above address.

New Etchant for Aluminum

Oakite Products, Dept. MF, 118 Reector St., New York 6, N. Y.

This firm, manufacturers of specialized cleaning and related materials, has announced the development by the company's chemical research laboratories of Oakite Composition No. 60, a material designed to produce a heavier, more uniform etch on aluminum.

Among the advantages reported by the manufacturers to be brought to aluminum-etching operations by this material are the following: (1) it etches rapidly, giving a controlled etch of any depth desired, while imparting a

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velvet-like appearance to the surface; (2) eliminates hard scale build-up on tanks and heating coils, leaving only a light, soft sludge which is easily removed by a hose rinse; (3) provides consistent, uniform etching without excessive foaming or fuming; (4) working solutions have long life, run 2, 3 or 4 weeks and longer before dumping is necessary; and (5) solutions are easy to work with, do not become clouded with suspended matter. After etching with Oakite Composition No. 60, parts rinse readily in cold or hot water, the manufacturers state.

Additional information regarding this material — including data on recommended solution concentrations, working temperatures and suggested immersion and rinsing procedures — is provided in a special Service Report available without charge to readers writing on company letterhead to the above address.

Cork-Surface Polishing Belt

Minnesota Mining and Manufacturing Co., Dept. MF, 900 Fauquier St., St. Paul, Minn.

A new coated abrasive polishing belt that uses granulated cork rather than conventional mineral grains for obtain-



ing a very high luster on glass, ceramics, metal and plastic has been announced by this manufacturer.

Designated the 3M "Wetordry" brand polishing belt, it is designed primarily as a glass edge-polishing tool, although it is expected to find numerous applications in various other fields.

The new belt is designed to replace the conventional buffing wheels and cork set-up wheels, eliminating set-up time and resulting in faster polishing, higher finishes, and lower unit cost.

The cork surface of the belt is sized with resin combined with a polishing agent that is said to improve the polishing action.

The belt is made with a water-proof,

EXTREME Versatility

for Lower Finishing Costs



CLAIR SURFACE FINISHING MACHINES

A versatile Clair Surface Finishing Machine may be the answer to economical, production-quality surface finishing of your products. Combining the "touch" of the old time craftsmen with extreme versatility and high speed production, Clair Surface Finishing Machines are soundly engineered and ruggedly built.

By cooperative counsel between your engineers and Clair designers, custom surface finishing equipment may be developed to give maximum efficiency and economy on your metal finishing operation.

May we show how Clair Surface Finishing Machines can save money for you? Write for technical data.



SPECIALIZED MACHINE EQUIPMENT FOR GLAZING AND POLISHING OPERATIONS
CLEAN, N. Y.

cloth backing to which the cork granules are resin-bonded. Water is recommended as a lubricant in glass grinding operations and oil or grease for use with metal.

The new belt is used with the regular abrasive grit sequences in the grinding and polishing processes and results in a greatly improved surface finish, the company said.

The new belt is available in a single universal surface in all standard sizes for existing abrasive belt grinding and polishing equipment.

Liquid Chiller

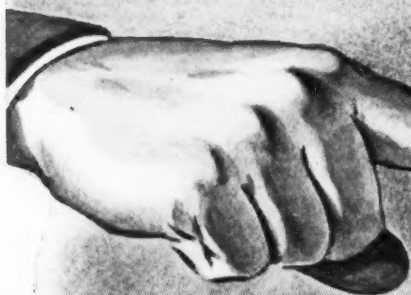
Brunner Manufacturing Company,
Dept. MF, Utica, N. Y.

A new liquid chiller, designed for use in hundreds of varied commercial

and industrial applications, is announced by the above company. This new unit is an ice builder as well as a chiller, building up quantities of ice in low requirement periods for use during peak load demands. The interior of the cabinet is entirely lined with copper, with copper plates and copper coils used throughout to eliminate corrosion. 16 gauge galvanized steel (aluminum optional) is used for the cabinet exterior, with aluminum doors and 4 inch cork insulation.

It is stated that liquids may be chilled by passing through the chiller cabinet itself, or by secondary circulation of chilled water piped from the unit. Each plate in the chiller is individually refrigerated, as well as the front and back walls of the cabinet. An exclusive mixing chamber pre-cools the

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When you see that triangle and "999+FINE" mark on a silver anode you can be sure of three things about that anode—(1) it is free of every trace of impurities that can cause plating troubles—(2) it measures up to highest standards in fineness—(3) it has physical properties that are ideal for plating . . . And when you *use* those anodes you can be sure of smooth going, profitable production of top quality plating. Next time you buy silver anodes, try the "999+FINE" brand and see the difference.

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Providence, R. I. • Toronto, Can.

liquid and passes it back and forth across the chiller plates and ice filled passes. Direction of liquid is reversed on an average of every three feet . . . with a total travel of about 60 lineal feet throughout the cycle. Refrigeration for the unit is provided by the Brunner slow speed open type condensing unit . . . sized according to the requirements of the job. Models $\frac{1}{4}$ to $7\frac{1}{2}$ HP are completely assembled at the factory, requiring only simple piping and electrical connections. Capacities range from 347 to 4960 pounds of usable ice daily. Larger models sized to requirements come in two sections, (1) chiller cabinet and (2) refrigeration unit. These are easily assembled in the field. Full production of this new chiller is now under way at the Brunner plant.

New Mask and Shield

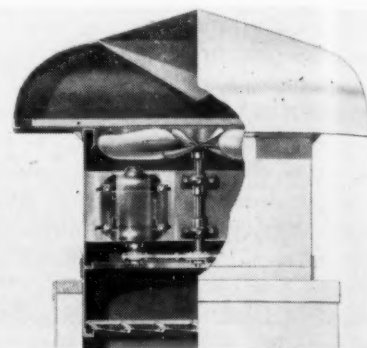
*General Scientific Equipment Co.,
Dept. MF, 2700 W. Huntingdon St.,
Philadelphia 32, Pa.*

This featherweight Lumarith plastic mask and cotton gauze filter is very effective for numerous light dusts and chipping hazards. Protects nose, lungs, face and eyes against nuisance dusts, chips and particles in all types of light, non-toxic work. The filter pad consists of cotton and sanitary gauze specially treated for softness and is replaceable. The GS No. 34 Mask and Shield is low in cost, \$7.80 per dozen for the complete unit. Extra filters are available at \$2.00 per hundred.

For complete information, trial order, write to the manufacturer.

New "Low Type" Ventilator

*The Eurt Mfg. Co., Dept. MF, Akron
11, O.*



Designed to meet modern architectural requirements for a highly efficient power driven fan ventilator that is low in height and of pleasing and inconspicuous design, Burt's new Low Type Ventilator is finding many new applications in industry.

The company engineers have combined high capacity, weather-proofing, quietness and high efficiency with simplicity of installation in the new unit. It may be used with equal efficiency either as an exhaust fan ventilator or as a fresh air supply unit.

The ventilator can be supplied with either a direct motor-driven fan or with a V-belt and pulley drive. Sizes range from 12" to 60" fans. Standard construction is prime galvanized steel but other material, such as aluminum, stainless steel, etc., may be employed for special purpose use. Special Low Type Ventilator Bulletin SPV-16 available on request to the above company.

New Liquid Stops Corrosion

*Kelite Products, Inc., Dept. MF, 1250
North Main St., Los Angeles 12, Calif.*

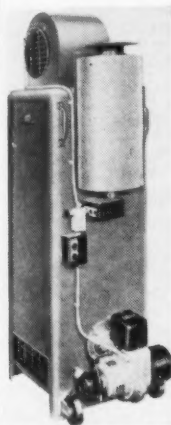
The protection of mild steel from corrosion after cleaning can now be achieved by the application of a recently developed homogenous solution known as Kelite M-2. The product is claimed to be superior to petroleum oil used for the same purpose since it affords vastly superior corrosion inhibiting properties, eliminates the need for drying prior to treatment, and is impervious to finger-printing.

Kelite M-2 may be applied by immersion, spray or brush. It is non-flammable (flash point 140°F.), non-phenolic and non-toxic. It will not burn the skin and its vapors are not harmful when breathed. Most outstanding of its qualities is a unique ability

to displace and absorb up to 11% of its own volume in water without impairment of efficiency. It is this quality which makes it possible to eliminate the drying operation prior to treatment. Complete details are available from the manufacturer.

Space Heater

Fageol Heat Machine Co., Dept. MF,
5725 Mt. Elliott Ave., Detroit 11, Mich.



A new 168,000 B.t.u. space heating unit with an adjustable vent for permanent installation or portable on-the-job use, is announced by this firm.

Known as the model VO-168, the new machine operates on the exclusive Fageol counterflow principle

of spraying heated air out across floor areas to form a 6-foot-high blanket of warmth in the work zone. According to the manufacturer, this principle of heating from the floor up avoids wasting heat in unused overhead areas.

When used with a flue and vented outside, model VO-168 is recommended for permanent use in confined areas such as small plants, garages, offices, warehouses, gas stations, foundries, barns, stores, barracks, trailers. Heat output vented is 130,000 B.t.u. per hour. When used without a flue, free heat is directed back into the blower and discharged "superheated," increasing output to 168,000 B.t.u. per hour. Unvented, the new machine is recommended for on-the-job use in construction work, in large drafty buildings, on loading docks. Equipped with wheels for easy portability, it can also be used for drying plaster, paint and concrete.

Model VO-168 operates from a detached fuel supply, burning No. 1 or No. 2 fuel oil, kerosene or diesel oil. A 10-gallon fuel tank may be attached to the unit as optional equipment. Dimensions of the machine are 21" x 33" x 69". Weight is 345 pounds. Burner is UL-approved gun type, pressure atomizing. The machine can be started or stopped by simply snapping a switch. Write the above firm for Bulletin L-5391.



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SAVINGS MOUNT when you install a Blakeslee Solvent Vapor Degreaser. Metal parts are rendered 100% oil-free and dry in a matter of seconds. You save on rejects in your finishing process—you save time—you save labor and you add LESS SOLVENT daily with a **BLAKESLEE DEGREASER**. "We sure have cut our degreasing costs since we installed that **BLAKESLEE** solvent vapor degreaser."

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BUSINESS ITEMS

Minnesota Mining & Mfg. Co. Appoints Guthrie

Appointment of **Donald R. Guthrie**, as executive engineer in charge of engineering research was announced by **Minnesota Mining & Manufacturing Co.** recently.

C. P. Pesek, vice president in charge of engineering and properties, said Guthrie will organize an engineering research group consisting of three sections: Chemical engineering, machine development and instrument engineering.

The purpose of the new group will be to provide specialized engineering

assistance to engineers in the company's various product divisions.

Guthrie joined 3M as a research chemist in 1939. He was made a division engineer in 1944. He received his degree in chemical engineering from the University of Iowa in 1938.

Division Lead Appoints Feldman

Joe A. Stone, Executive Partner of the **Division Lead Company**, 836 West Kinzie St., Chicago, Ill., recently announced the appointment of **Louis V. Feldman** as Technical Director of the firm.

Formerly Research Project Engineer with **Continental Can Co.**, Mr. Feldman holds his Bachelor of Science degree in Chemical Engineering from Illinois Institute of Technology, his Master of Business Administration

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TUMBLING BARREL**

For nearly $\frac{3}{4}$ of a century HENDERSON BROS. has been helping manufacturers solve their Tumble Finishing problems with a wide variety of Tumbling Barrels. . . Sided Wood Barrels, Round Wood Barrels, Perforated, Cast Brass, Cast Iron, Welded Steel Barrels and Rubber Lined Barrels in the Tilt type and Horizontal Type for Bench and Floor installations. Where special processes call for special barrels, Hendersons is prepared to design and construct Tumbling Equipment to customer specification.

Write us, outlining your particular problem. Our Engineering and Development Service will be glad to make recommendations.

Since 1880 Designers and Builders of Tumbling Barrel Equipment.

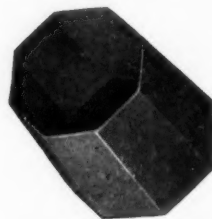
THE HENDERSON BROS. COMPANY
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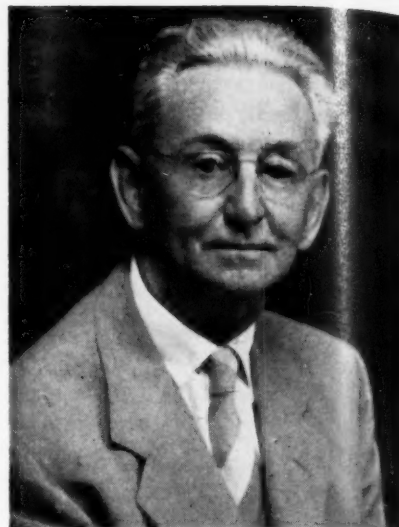
Sided
Wood
Barrel



Perforated Tilting Barrel



Welded Steel Barrel - Polygonal



Robert J. Malkmus

electroplating industry is one of the longest on record. It dates back to 1900 when he started with the *Eddy Electric Manufacturing Co.*, manufacturers of low-voltage plating generators.

From 1905 until 1923 he held purchasing and sales-management posts with other companies when, in the latter year, he became Purchasing Agent for *A. P. Munning & Co.* When this concern was combined with *The Hanson & Van Winkle Co.* in 1927, Mr. Malkmus was elevated to the same post in the new organization, *The Hanson-Van Winkle-Munning Co.*

Since 1919, Mr. Malkmus has been a member of the Purchasing Agents Association of New York City and he is currently serving as Vice President and Director of *The Matawan Bank*, Matawan, N. J.

**American Silver Co. Offers
Rolling Service**

Custom rolling of most ferrous and non-ferrous ultra-thin, high-precision metal strip in any quantity is now available to industry from the *Industrial Products Division, American Silver Co.*, 36-07 Prince St., Flushing 51, N. Y.

American Silver's metal processing facilities are employed exclusively in filling customers' orders to their specifications. These facilities include High-4-High and Sendzimir cluster rolling mills; close-tolerance slitting and shearing lines; and continuous atmosphere annealing furnaces. Use of this equipment permits the company to accept orders normally refused by other mills.

American Silver supplies strip in widths up to 8" in thicknesses down to .0005". Generally, gauge tolerances of plus-or-minus .0002" are held on thick

from the University of Chicago. Solders, fluxes and alloys are his field; he holds several patents on special and non-corrosive soldering fluxes.

Included in Mr. Feldman's duties will be field research and supervision in major soldering problems, development of new Divco products and continuous improvements of established ones, technical advisory status with regards to Divco literature and advertising material.

**Beckman Instruments, Inc.
Purchases Berkeley Scientific Co.**

The purchase of the business and assets of *Berkeley Scientific Corp.*, of Richmond, Calif., by *Beckman Instruments, Inc.*, South Pasadena, Calif., has been announced by *Dr. Arnold O.*

Beckman, President of *Beckman Instruments, Inc.* The *Berkeley Scientific Corporation* has been dissolved and the operations will continue as the *Berkeley Scientific Division* of *Beckman Instruments, Inc.* No changes in management or personnel are contemplated. *W. K. Rosenberry*, founder and President of *Berkeley Scientific*, becomes a Vice-President of *Beckman Instruments, Inc.*, and will remain in charge of operations at the Richmond Plant.

**Robert J. Malkmus Retires
After 29 Years**

The Hanson-Van Winkle-Munning Co. announces the retirement of *Robert J. Malkmus* after more than 29 years as Purchasing Agent, a service which dates back to a predecessor company.

Malkmus's association with the

nesses from .010" to .006"; tolerances of plus-or-minus .0001" are held on thicknesses below .006".

Riverside Metal Co. Elects Henry S. Freynik Vice-President

Mead W. Batchelor, President of The Riverside Metal Company announces the election of Henry S. Freynik as Vice-President.

Freynik has worked in The Riverside Metal Company since 1923 and has been Chief Metallurgist for the past twelve years. He is active both in this country and Europe in the non-ferrous metal field, and was chosen to confer at the World Metallurgical Congress in Detroit last October.

He was educated in Metallurgy at Temple University and Drexel Institute of Technology. He is a member of the American Society For Metals, American Foundrymen's Association, American Institute of Mining and Metallurgical Engineers, and the American Society for Testing Metals in which he serves on the Non-ferrous Committee.

Pittsburgh Plate Glass Appoints Dr. George S. Bachman

Appointment of Dr. George S. Bachman as Director of Research for Pittsburgh Plate Glass Company's new Fiber Glass Division has been announced by J. Hervey Sherts, general manager of the division.

Dr. Bachman joined the company during 1947 and since then has been associated with the glass division's research laboratories at Creighton, Pa.

A native of Lebanon, Pennsylvania, Dr. Bachman is a graduate of Penn State with the degrees of B.S. and M.S. in Ceramics. Later he received the



George S. Bachman

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CHROMIC ACID

SODIUM BICHROMATE

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New York 16, N.Y.

degrees of B.S.C., Chemical Engineering from the University of Michigan and Ph.D., Ceramics, from the University of Illinois.

Prior to his association with Pittsburgh Plate, Dr. Bachman had served as a ceramic engineer with Owens-Illinois Glass Co. During three World War II years, he had served in the U.S. Army's Chemical Warfare Service.

Dr. Bachman is a member of the American Ceramic Society and the American Chemical Society. As Director of Research, his headquarters will be located at Shelbyville, Ind., where production facilities and laboratories are being installed for the production of strand and superfine Fiber Glass. Initial production from the plant is expected within the next few months.

Graduate Fellowship Announced

The University of Michigan Department of Chemistry recently announced a graduate fellowship in electrochemistry to promote fundamental research in that field and train more electrochemists for key industrial positions.

Established by General Motors and approved by the University's Board of Regents, the fellowship provides a cash award of \$1800 to the fellowship holder and \$1000 to the University to cover tuition, special apparatus and other incidental costs.

It will be offered during 1952-53 and will be subject to renewal from year to year.

Chemistry Professor Alfred L. Ferguson said the fellowship, believed to

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Partial view of Ford heat treating department. Fumes and vapors from heating, quenching and cleaning operations are controlled by Kirk & Blum Systems.

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TRANSMISSION PLANT

FOR CLEAN AIR...THE INVISIBLE TOOL

KIRK^{AND}BLUM
FUME CONTROL SYSTEMS

In the ultra-modern Ford Motor Company Automatic Transmission Plant, 37 distinct Kirk & Blum Systems aid in the production of Merc-o-Matic and Ford-o-Matic transmissions by exhausting more than 130,000 CFM . . . with a separate replenishing system providing tempered air.

Control of fumes and gases in heat treating, quenching, cleaning, and other operations is efficiently accomplished by KIRK & BLUM engineered, fabricated and installed Systems.

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be one of the first limited to basic research in the field of electrochemistry, followed a study by the *Electrochemical Society* revealing that:

1. College and university chemistry departments have tended to eliminate electrochemistry from their curriculums.
2. Industries and research organizations have failed to make known to academic institutions the growing need for electrochemists.

"Both of these situations," Prof. Ferguson said, "have resulted in lack of knowledge on the part of students of the fact that there actually do exist great opportunities in this rapidly expanding and diversified industry."

Prof. Ferguson explained also that more qualified teachers are needed in

the electrochemical field. The general policy in industry, he added, has been to train electrochemists on the job. Admittedly, he said, this is expensive and unsatisfactory.

The fellowship will involve fundamental research suitable for a doctoral dissertation and the recipient will be nominated by electrochemistry teachers on the University's Department of Chemistry faculty.

Foxboro Appoints Deaderick

The *Foxboro Company*, Foxboro, Mass., manufacturer of industrial instruments, announces the appointment of *Mr. John Deaderick* as manager of the Philadelphia Office at 1621 Chestnut St., serving the industrial sections of eastern Pennsylvania and southern New Jersey.

Mr. Joseph Esherick, well known in industrial circles through his many years as district representative of the company in Philadelphia, now devotes his entire attention to Special Accounts, serving as manager of that department.

Mr. Deaderick, since receiving his engineering training at Texas A. & M., has had extensive experience in the oil and gas industries. Previously serving as industrial engineer at Foxboro branches in Corpus Christi, Texas, and Baton Rouge, La., and as manager of the Tulsa, Oklahoma, branch, *Mr. Deaderick* brings to his new assignment a thorough knowledge of modern instrumentation and its application to industrial processes.

American Wheelabrator Appoints Schamel

Walter S. Schamel has been appointed district manager of the Los Angeles office for American Wheelabrator & Equipment Corp. He opened new offices at 1355 Leonis Blvd., Vernon, Los Angeles 58, on August 1, and handles the company's complete line of products, including dust collectors, abrasive blasting machines, and other foundry equipment.

Schamel has been in the company's rust and fume control division at the home office for the past 6½ years, first as sales engineer and most recently as assistant technical director. He is a civil and mechanical engineering graduate of the Missouri School of Mines and Metallurgy.

Lasalco Appoints Chicago Distributor

Lasalco Inc., 2818-38 La Salle St. St. Louis 4, Mo., announces the appointment of the *Kaynide Division—Kraft Chemical Co.*, 971 West 18th St., Chicago 8, Ill., as their equipment distributors in the Chicago Metropolitan Area.

Kaynide Division offers complete chemical and process service as well as a complete line of plating equipment. They invite inquiries which will be promptly and efficiently handled by their staff of Electroplating Engineers.

Minneapolis-Honeywell Appoints Peterson

The appointment of *C. L. Peterson* as general sales manager of the Industrial Division of *Minneapolis-Honeywell Regulator Co.* was announced

recently by *L. Morton Morley*, vice president of the division.

Mr. Peterson has been regional manager for Honeywell's midwest region in Chicago since January, 1950. He succeeds *W. H. Steinkamp*.

An engineering graduate of the University of California, Peterson joined the company in 1927 as sales engineer in the San Francisco office. In 1945 he was appointed regional manager for the parent company's Pacific region.

Speer Carbon Co. Appoints Martin

Fred D. Martin, former assistant plant manager in charge of plants 1, 2 and 4 of *Speer Carbon Company*, has been appointed to the plant management of the entire St. Marys, Pa., manufacturing facilities of the company.

Mr. Martin joined Speer in July 1935 as research engineer. During his years in the Research Department, he was responsible for the development of a method for electroplating chromium on carbon, contributed to the producing of high purity graphite for A. E. C., developed techniques and impregnants for impregnating carbon, and conducted extensive research in the development of carbon products.

Before being appointed assistant plant manager, he set up the Quality Control Department.

Two New Stokes Field Representatives Appointed

Richard T. Voelz and *Truman S. Brown* were recently appointed field representatives for the Chicago and Los Angeles sales offices, respectively, of the *F. J. Stokes Machine Co.*, Philadelphia, Pa.

A 1949 graduate in Mechanical Engineering from the University of Wisconsin, the new Chicago representative also holds a Masters' Degree from Northwestern University in Mechanical Engineering. Prior to his joining the Stokes organization, Voelz worked for the *National Engineering Co.*, Chicago, Ill. He resides in Wilmette, Ill.

Brown, the new Los Angeles representative, attended the University of Minnesota Engineering School and the University of Illinois, where he majored in Business Administration. He was previously employed by the *Northwestern Bell Telephone Co.* He will be working under *Ray B. Anderson, Jr.*, district manager of the Stokes West Coast office in Los Angeles.

Extra ways to save with Coating 218X

NOTHING BETTER FOR RACKS . . .

Users of Coating 218X know this green plastisol can't be beaten for rack protection. They've seen it stand up in all plating and anodizing baths, the toughest cleaners, even vapor degreasing cycles. Bumps, abuse, abrasion — all taken without damage by this flexible, shock absorbing, thick coating. In short, it gives them more rack protection, with less maintenance, and therefore the least cost.

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Coating 218X will work for you in more ways than one—to save money, equipment, time. Ask us about it.



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Los Angeles 13, Calif. • In Canada: United Chromium Limited, Toronto, Ont.

U. S. Rubber Establishes Fellowship

United States Rubber Co. has established a five-year graduate fellowship in science at the *University of Notre Dame* at South Bend, Ind., it was announced recently. The fellow will be selected by the university in accordance with its established practices.

The rubber company recently announced the renewal of a five-year program of financial aid to science students in 11 other leading universities.

Raybestos-Manhattan Has New Houston Warehouse

Raybestos-Manhattan, Inc. announces the opening of a new Houston warehouse at 3012 Canal St. which offers

larger quarters with ample stocking facilities for servicing the expanding Gulf Coast industrial area.

The warehouse will supplement and service distributors' stocks and will permit prompt service and deliveries. The principal products carried will be conveyor belting, transmission belting, V-belts, industrial hose of all types, and asbestos and rubber packings.

The Houston warehouse is in charge of *M. C. Nugent* and operates under the Dallas Office, *E. W. Nagel*, manager.

Raybestos-Manhattan, Inc. also announces the appointment of the *Webster-Robinson Machinery & Supply Co., Inc.* as a new distributor of belting, hose and other industrial rubber products in the Tacoma, Washington area.

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Peter L. Veit Joins Weston International Assoc.

Weston International Associates of New York City have announced the addition of Mr. Peter L. Veit to their Engineering Staff. Mr. Veit will supervise the metal finishing operations in the plant.

Having studied metallurgical engineering and chemistry at the Polytechnic Institute of Brooklyn, Mr. Veit has been associated with the Technical Service Department of Oakite Products, Inc. for the past four years. During this time, he did both experimental and development work on various phases of metal finishing.

Mr. Veit is the author of several ar-



Peter L. Veit

ticles on barrel finishing and presently holds the position of Librarian in the New York Branch of the American Electroplaters Society.

United Chromium Appoints Clifford R. Palkie



Clifford R. Palkie

Clifford R. Palkie, well known in the protective coatings field, has joined the staff of United Chromium, Inc. as Assistant Sales Manager of their Organic Coatings Division. Supervision of sales of vinyl chlorinated rubber, and phenolic coatings in the line of Ucilon Protective Coatings will be Mr. Palkie's immediate assignment.

Included in Mr. Palkie's experience are 6 years with the Corrosite Corp., the last two years of which were spent as Assistant Sales Manager. During World War II, he served as a pilot in the Army Air Force, seeing duty in the European theatre of operations.

Addition to Roberts Rouge Co.

Roberts Rouge Co., Stratford, Conn., have started a brick and steel addition of 15,000 square feet of manufacturing space. Completion is expected in four weeks.

The new building will be furnished with the latest equipment for producing a line of compounds new in their field. Announcement of the new compounds will be made in the near future.

Frederic B. Stevens Appoints Gagnon

Louis V. Gagnon has been appointed Massachusetts Sales Representative for Frederic B. Stevens, Inc.

Mr. Gagnon will work from the company's New England Branch at New Haven, Conn., and will represent

Steven's entire line of Metal Finishing Equipment and Supplies.

Before joining Stevens he was employed as a representative of the *Bart-Messing Corp.* Prior to that he worked his way up from plater's helper to



Louis V. Gagnon

Superintendent of electroplating. He also worked six years as control chemist and buffing and polishing foreman.

Gagnon attended Tufts College and Lowell Institute School of M. I. T.

He has held various offices in the *Boston Branch of American Electroplaters' Society*. From 1947 through 1950 he was president of the branch and delegate to the National Convention. Gagnon also has been active in the development of *Junior Achievement, Inc.*, promoting young people's interest in free enterprise.

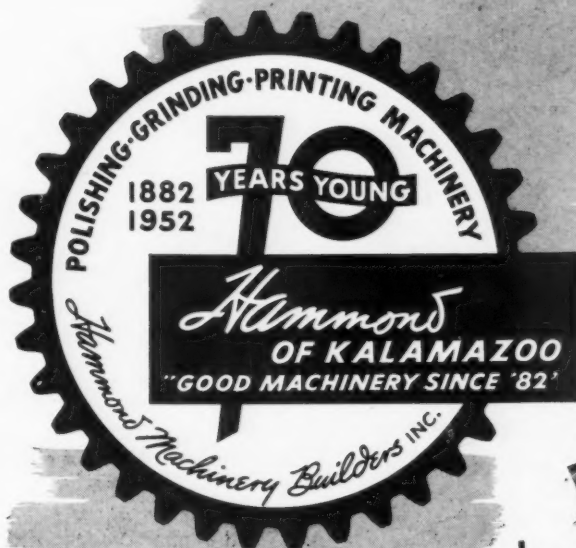
R. L. Hundley Co. Moves to Larger Quarters

Mr. R. "Lee" Hundley, President of the *R. L. Hundley Co.*, announces that as of September 1st, the firm will be located at 1937 W. Fond du Lac Ave., Milwaukee 5, Wis. The *R. L. Hundley Co.* is direct factory representative in Wisconsin and Minnesota for buffs and contact wheels manufactured by *United Buff Products Corp.*, Passaic, N. J.

Alcoa Advances Harry L. Smith

Harry L. Smith, Jr., has been made Staff Manager — Product Sales for *Aluminum Company of America*. Mr. Smith, who has been manager of sheet and plate sales, is a veteran of 38 years' service with the company.

W. T. Mitman, now with Alcoa's

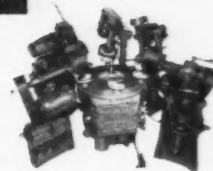


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for EXPERIENCE*

With the new and better constantly coming into the picture and the old going out, these 70 years have not been long.

Even so, they have piled up a big bank of experience to which we add and draw from each day.

We are grateful for the confidence of tens of thousands of HAMMOND users. For them and for all, through ever broadening research, engineering, and production, we propose to insure another 70 active and eventful years.



Model K-46-6 Super 5 Head Rotary Automatic. (One of a line of Rotary, Strait-Line, and Jr. Automatics).
WRITE FOR CATALOG A-50



Model VRO "DIAL CONTROLLED" Variable Speed Polishing Lathe with Model 3-A (air-tensioned) Backstands.
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MODEL RRO Single Speed—Two Spindle—Two Motor Polishing and Buffing Lathe. Each spindle can be driven at speeds from 1800 to 3600 RPM.
WRITE FOR CATALOG A-60

Hammond Machinery Builders INC.

1601 DOUGLAS AVENUE

KALAMAZOO, MICHIGAN



Harry L. Smith

Washington, D. C., Sales Office, will succeed Mr. Smith as manager of sheet and plate sales.

In his new position, which has just been created, Mr. Smith will work closely with the vice president in charge of product sales and with the sales managers for the various company products.

New Denver Warehouse for Raybestos-Manhattan

Announcement of the opening of its new Denver, Col., warehouse at 4500 York St. on August 15, has been made by *Raybestos-Manhattan, Inc.*, Passaic, N. J. The newly erected building has modern office and warehouse facilities. It has been designed for proper storage conditions and for quick truck de-



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For over three quarters of a century, APW has maintained the highest standards possible in production and in the laboratory. This has resulted in products which give complete satisfaction and cleaner, brighter finished work.

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liveries. Ample space is provided for carrying good stocks for proper servicing of the area. The new warehouse will serve the entire Rocky Mountain region with industrial rubber products and packings, as well as the Rocky Mountain and Western Canadian oil fields with hose, belting, packing and friction materials.

Adequate supplies of industrial flat transmission belts, V-belts, conveyor belt, hose, packings, also oil field hose, belting and friction material will be stocked at the warehouse. Daily delivery service will be available for Metropolitan Denver and outlying areas. Trained personnel and modern equipment will be maintained for coupling hose, and matching V-belts to serve the industrial and oil field trade.

Elton T. Fair, Jr., sales representative for the territory, is in charge of the new warehouse.

Arthur D. Little, Inc. Opens St. Louis Branch

The opening of a mid-west office in St. Louis, Mo. by *Arthur D. Little, Inc.*, leading consulting industrial research and engineering firm of Cambridge, Mass., was announced recently by the firm's president *Earl P. Stevenson*.

In his announcement Mr. Stevenson indicated that the new branch, located in the Railway Exchange Building, Room 2074, St. Louis 1, Mo., would serve as a base for the organization's Technical Economic Survey work in economics and market research in the mid-west. He also stated that the branch "... will help to maintain contact with the many mid-western clients who retain *Arthur D. Little, Inc.*, for development of new products and processes and for scientific investigations."

Chosen to head the new mid-west branch was Kansas City born *John R. Kirkpatrick*. Mr. Kirkpatrick opens the St. Louis office with broad experience in the economic and market research fields. He was recently responsible for the industrial development activities of *Arthur D. Little, Inc.*, on behalf of the Puerto Rican Government.

Mr. Kirkpatrick was graduated from the Westport High School in Kansas City, Mo., and from the Massachusetts Institute of Technology with a degree in Business and Engineering Administration.

While in the Boston area, Mr. Kirk-

patrick was active in the American Marketing Association and recently served as Membership Chairman of the New England Chapter.

Arthur D. Little, Inc., is also represented in New York City and Mexico City.

New Fellowship Fund Established by Westinghouse

A fellowship fund to help promising young engineers and scientists of the Westinghouse Electric Corp. continue their studies at a graduate level has been established in honor of the late Leon R. Ludwig, outstanding inventor and Westinghouse engineering executive.

Announcement of the educational trust was made by A. C. Monteith, Westinghouse vice-president in charge of engineering, who also is a member of the Fellowship Committee which will administer the Fund. Mr. Monteith said the Fund was established by Mr. Ludwig's widow, Mrs. Agnes S. Ludwig and daughter, Martha, at the time of the Westinghouse executive's death November 14, 1951.

A prolific inventor, he had more than 70 patents to his credit and during World War II made important contributions to the development of the atomic bomb. One of his most outstanding achievements in the field of electrical engineering was the development in collaboration with Dr. Joseph Slepian of the ignitron rectifier.

Talchem Appointed by Wyandotte

Talchem has been appointed United States distributor for Wyandotte Chemicals Corp. with franchise to distribute Wyandotte products in certain foreign countries, according to an announcement by Lloyd F. Coates, Talchem general manager.

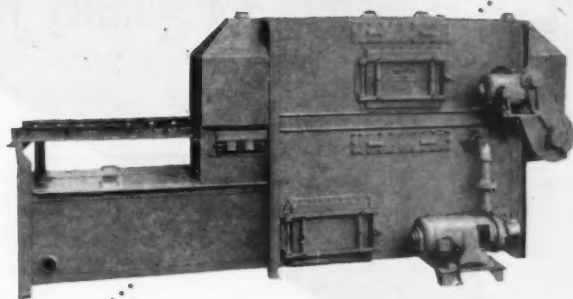
The contract, signed by Samuel L. Wilson, executive vice-president of Transocean Air Lines, parent company of Talchem, for Talchem, covers products in the aviation, industrial, marine, automotive, manufacturing and food processing fields. P. C. Spencer, district sales manager for Wyandotte in San Francisco, signed for that firm.

Coates pointed to the signing as a major step in attaining Talchem's objective of world wide distribution, stating that the contract gave Talchem a more complete line of products and faster delivery, through Wyandotte's strategically located plants and warehouses. As soon as experienced person-

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each A-F washing machine

*This A-F Machine was built specifically for removing cyanide from hardened gears... quickly, efficiently, economically!



is designed for a SPECIFIC* cleaning problem

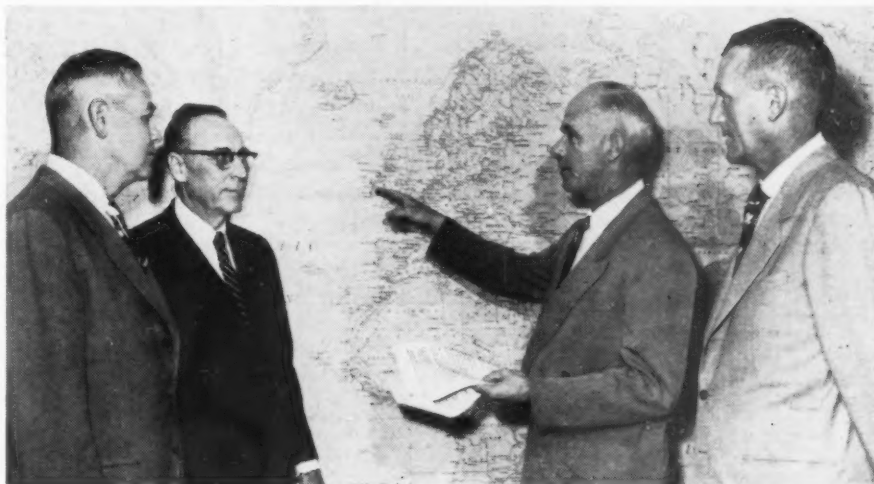
This A-F TRADE MARK assures "quality control" in your metal products washing operation.



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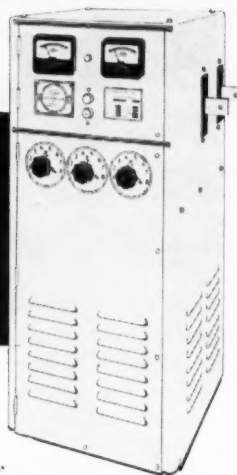
Holding contract which establishes Talchem, Transocean Air Lines subsidiary as United States and foreign distributor for products of the Wyandotte Chemicals Corporation is Samuel L. Wilson, executive vice president of Transocean. Looking on are, Lloyd F. Coates, general manager of Talchem, left, P. C. Spencer, San Francisco district sales manager for J. B. Ford division of Wyandotte, and William T. Kiernan, sales and service supervisor of Wyandotte, extreme right.

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ANNOUNCING PERIODIC REVERSE

You may now obtain a R-A Periodic Reverse Unit for electroplating generators, and one for electroplating rectifiers up to 2,000 amperes.



For increased production, improved quality, fewer rejects, lower labor costs—which translates into higher profits—use Richardson-AlLEN dependable rectifiers.

The basic R-A Rectifier is widely used where a single voltage or current is needed or where several rectifiers are to be paralleled.

For electroplating chrome or bright nickel a 22-position tap switch is supplied. For electroplating gold or silver, and for anodizing a 36-position tap switch is used.

A special Heat Exchanger unit is available for use in corrosive atmospheres. This R-A development permits operation at elevated ambient temperatures with a minimum temperature rise. Long, uninterrupted, dependable service is assured.

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nel can be obtained. Talchem will open district offices in New York City, Chicago, Dallas, Atlanta and Kansas City, to augment its west coast operations, he said.

The contract also will give Talchem the advantages of the 62-year old Wyandotte corporation's vast research program which has developed many new materials for the armed forces, the Federal government and private firms. The Wyandotte corporation is now building a \$2,500,000 research center at Wyandotte, Michigan, he added.

These important research and development programs assure Talchem of materials of uniform high quality and leadership in offering new and

better products to its customers. Coates declared. In addition, services of Wyandotte's highly trained specialists in 35 principal cities will be available to Talchem service engineers.

Talchem was formed in April, 1951. Headquarters is located at 15890 Hesporian Blvd., San Lorenzo.

Plating on the Distaff Side

Every rule has its exception, and in the electroplating field it is Irene Donnelly, who is one of the very few women who have been able to enter this industry. She is a pioneer in a field previously shut tight against women.

Miss Donnelly studied chemistry and began as a technical worker at the Scientific Control Laboratories in Chi-



Irene Donnelly

cago, and is becoming an outstanding figure in industrial finishing. She also has the distinction of being the only woman in the Chicago branch of the American Electroplaters' Society.

There is no easy way to enter this field, according to Miss Donnelly, as she believes that basically it's chemical engineering and requires more mental effort than medicine or other specialized fields. It has been a long struggle for this determined young lady to reach the top, but she has found the effort to be tremendously rewarding.

Our hats are off to Miss Donnelly and we wish her continued success.

Dr. C. Manning Davis Joins International Nickel Co.

The appointment of Dr. C. Manning Davis as Head of the Analytical Section of the Research Laboratory of The International Nickel Company at Bayonne, N. J., effective August 1, was announced by N. B. Pilling, Director of the Research Laboratory.

Dr. Davis was in charge of The Elgin Watch Co. Fellowship at the Mellon Institute for Industrial Research at Pittsburgh from November, 1947, until July 1st, last. His activities there included pilot plant operation, organic synthesis and organic analysis. Prior to that he was in charge of the Analytical Laboratory of the Fisher Scientific Co. at Pittsburgh for over 5 years.

He has been Chairman of the Analytical Division of the Pittsburgh Section of the American Chemical Society and was Chairman of the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy in 1951.

Dr. Davis received his B. A. from Missouri College in 1933; M. S. from

Tulane University in 1940; and Ph. D. from University of Pittsburgh in 1952.

Course in Electroplating

The City College, School of General Studies, Evening Division, Convent Avenue at 138th Street, New York City, announces a course in Practical Electroplating.

Time: Mondays, 7:00-8:50 p.m. Fall, 1952. First Session—Mon., Sept. 22, 1952.

Course: TCh. 4. Practical Electroplating.

Registration: September 16th and 17th, 6:30-8:30 p.m., Main Bldg., Convent Ave. & 139th St., N. Y. C.

Fee: \$18.

The primary object of this course is to provide commercial electroplaters with a sound understanding of the principles underlying their work; application of pH; principles of metal plating; plating with the various metals; surface preparation; uniform plating thickness; plating on non-conductors; electroforming records and electrotypes, electropolishing; testing of metal deposits; analysis and control of plating solutions.

Prerequisite: A college course in general chemistry or extensive commercial electroplating experience.

Wyandotte Chemicals Adds to Grand Rapids Staff

Russell C. Fancher was recently transferred by Wyandotte Chemicals Corp. from Detroit to Grand Rapids. Mr. Fancher replaces Clyde C. Craven, deceased, who was widely known to the metal finishing industry in Western Michigan.

Mr. Fancher has been a member of



Russell C. Fancher

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EQUIPMENT FOR THE SURFACE TREATMENT OF METAL

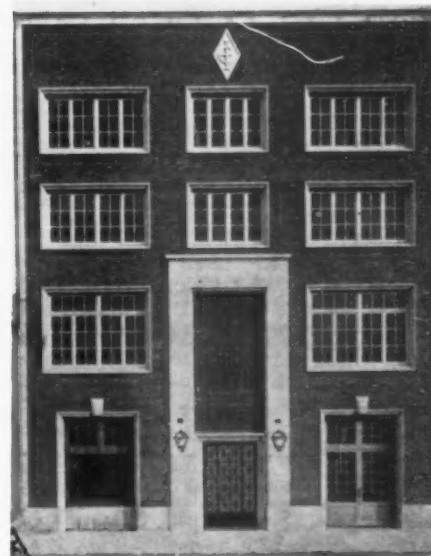
5819 VINE STREET

CINCINNATI 16, OHIO

the research and developments staffs of Packard Motors and Federal Mogul Corporation. He joined Wyandotte Chemicals in 1950 as a specialist in metal finishing operations.

Spanish Firm Moves to New Quarters

The *Instituto Electroquímico, S. A.*, formerly known as *Sanzy Massuet, S. A.*, has opened a new building in Barcelona, Spain containing the laboratory, workshop and administrative office. This is the first factory ever to be set up in Spain in this special line. They manufacture all types of plating rectifiers, general machinery, chemicals, etc.



Instituto Electroquímico

News from California

By Fred A. Herr



The decision of one faction of the *National Association of Metal Finishers* to separate from the parent organization and form a new group named the *National Federation of Metal Finishers*, finds the *Southern California Association of Metal Finishers* continuing to operate independently, with no tie-up with either national group.

H. W. Smith, executive secretary of the Metal Finishing Association of Southern California, who attended the Chicago conference in June at which the split developed, reported to *Metal Finishing* that his group was not in sympathy with the proposal to mandatorily make all members of local associations take out membership in the national organization. The Southern California association operates under

its own charter and proposes, Mr. Smith declared, to continue to function regionally by servicing its local membership, as it has in the past. No move toward affiliation with either of the national groups is currently being considered, he stated. Membership now is in excess of 50, with the rolls showing a gratifying steady increase, according to secretary Smith.

Highlight of the summer activity of the *Metal Finishing Association of Southern California* was a deep-sea fishing trip. Twenty-five members and guests signed up for the expedition, which was scheduled to take off at 2 a.m. August 20th from Pier Point Landing, Long Beach, on the chartered fishing boat *Mary Ann*. Albacore was the objective, anywhere between Long Beach and Catalina Island where they could be found, but the piscatorial platters were prepared to settle for the lower yellowtail or barracuda, if necessary. Among the fishing enthusiasts who made the trip were Secretary H. W. Smith, Howard Woodward, Andy Bertello, A. J. Ahlschlanger, Harold Coombes, Jr., and Dexter Halldin.

Latex Dipped Rubber Products Co., has completed installation on some new vulcanizer units in its enlarged plant at 4520 East Washington Blvd., Los Angeles, where the firm now has available some 3600 square feet of factory area for the production and application of industrial rubber linings for tanks, pipes and fittings.

The company's Blue Diamond curing process calls for the tanks, fitted with the uncured natural rubber lining, to be placed in the big vulcanizer. There the rubber undergoes a six hour curing cycle at varying temperatures up to 320°F., which fuses five separate plies of rubber into one piece. The vulcanizers are eight feet in diameter and 24 feet long. The company specializes in linings resistant to chemical or abrasive materials. John Mergel and his son, W. Mergel, serve, respectively, as president and general manager.

Artcraft Plating Company, 2532 Hollywood Way, Burbank, Calif., has completed an expansion program involving additions to its electroplating shop and enlargement of the electroforming department. Some \$35,000



Assure lower-cost operation, higher operating efficiency and more dependable service. For detailed information, send in the coupon for Bulletin 20-210.

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Cottons, wools, felt, glass, nylon, silk, vinyon, saran, metal mesh and many other synthetic materials cut and sewn in all shapes and sizes . . . many weaves, weights and finishes.

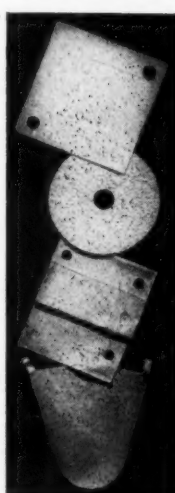
ASBESTOS PADS

Quality filtering pads furnished in a range of grades varying in porosity and filtering characteristics. Sizes and shapes for all needs.

OTHER "Filpaco" PRODUCTS: Filters, stainless steel storage and mixing tanks, fillers, pumps, conveyors, portable agitators, fittings and filter aids.

WRITE TODAY for further information and samples!

We will be pleased to discuss your filtration supply and equipment problems without obligation.



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worth of new equipment has been installed in the plating shop, including an 18 foot anodizer, a 500 gallon hard chromium tank, and a 600 gallon tank for dichromate treatment of magnesium. The new plating installations supplement holdover equipment which already included silver, chromium, cadmium and zinc plating facilities, and the nucleus for the now greatly enlarged anodizing setup. Four acid copper and one nickel tank have been added to the existing electroforming facilities. *James Barker* is president of Artcraft Plating Company, and *Meyer Roter* vice-president.

Roter and Barker have also announced the formation and incorporation of a new company controlled by them but operated separately from Artcraft Plating. The new firm bears the name of *Artcraft Enameling Company* and occupies a recently completed new building measuring 50 x 110 feet at 2536 Hollywood Way, adjacent to the plant of Artcraft Plating Company. Mr. Roter reports that the new enameling building and equipment represents an investment of some \$75,000. It is equipped to process airplane parts, electronic cabinets and various com-

ponents for the guided missile program and airplane factories.

Major equipment units include a 22 foot water wash booth, a 16 foot indirect-fired oven and an intra-plant conveyor system. *Meyer Roter* is president of the new enameling firm, *James Barker* vice-president, and *Joseph Swick* secretary-treasurer.

Bowman Chemicals, Inc., has completed a plant enlargement program which added 3,000 square feet of production area to its facilities at 4606 Long Beach Blvd., Los Angeles. The expansion, which doubled former factory and office space, included the addition of 2400 square feet to the production division, 400 square feet for new offices, and 200 square feet for oil storage. *J. M. Bowman*, president, announced that the building of new processing and chemical storage facilities was required to meet growing demands to serve the diverse needs of the aircraft, electronics, television, furniture and defense plants depending upon *Bowman Chemicals* for metal finishes. The company produces finishes for all metals and supplies certificates of com-

pliance with various government specifications.

Sparkler Manufacturing Company of Mundelein, Ill., has opened a new branch office and warehouse at 612 North San Vicente Blvd., Los Angeles, for servicing and storage of the firm's line of filtration equipment for industrial and commercial uses.

Metal Control Laboratories, Inc., Huntington Park, Calif., has completed installation of a new production control quantometer designed by *Applied Research Laboratories* of Glendale, Calif. The unit is designed to make chemical analysis of metals and alloys and determines the percentage concentration of 26 elements on 35 different ranges. The Huntington Park firm is reported to be the only commercial laboratory in the country equipped for this type of service.

Willcox Tinning Co., Los Angeles, has expanded facilities by the installation of a centrifugal machine and breaker for hot tinning small electronic parts.



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You can count on something extra

When you get pickling equipment made of Monel®, you really get the works.

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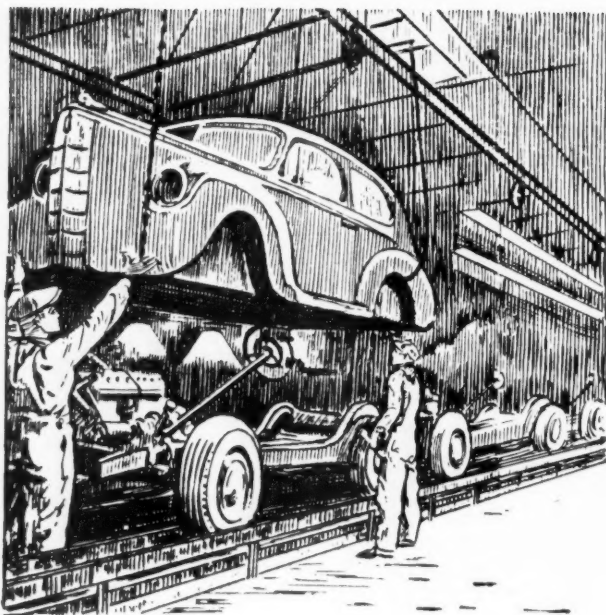
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4. Long service life — and wrought Monel equipment can be repaired for additional service life.

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THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.





MOTOR CITY PLATING NEWS



by

Edward F. Fiume

The July meeting of the *Plating Institute of Michigan* was held on Wednesday evening, July 9th, in the Normandie Room of the Sheraton-Cadillac Hotel in Detroit with several Michigan members attending.

A report of the *A.E.S. convention* and the meeting of the *National Association of Metal Finishers* held in Chicago was given by *James Mueller*, secretary of the Institute.

L. M. Glasser, secretary of the *Chi-*

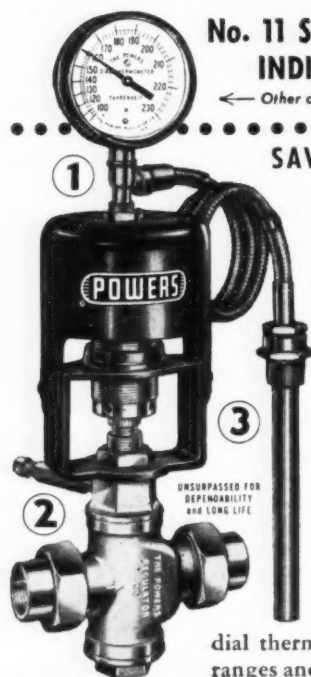
cago Electroplaters Institute, also was present and he gave his impression of the meetings held in Chicago.

R. C. Mahoney Co. and the *Atlas Plating Co.* were announced as new members of the Institute.

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No. 11 Self-Acting TEMPERATURE INDICATING REGULATOR

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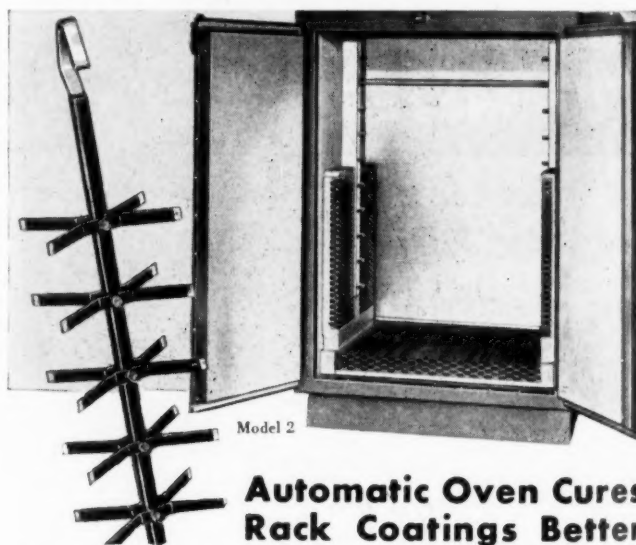
Automatically controls temperature of liquids or air at any point desired. Needs no compressed air or electricity for its operation.

3 Plus Values give you more for your money: 1) Easy to read 4" dial thermometer shows temperature of liquid or air being controlled, makes it easy to adjust regulator for proper temperature. 2) Has valve stem lubricator. 3) OVER-heat protection.

Powers No. 11 Regulators are available also without dial thermometer in a variety of 60° F. ranges and valve bodies 1/4" thru 8". (110)

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Automatic Oven Cures Rack Coatings Better

Automatically maintains correct preheating and curing temperatures for proper coating of plating racks. Holds any temperature for which set (between 300 and 450°F.). Layout of efficient Rack Coating Department and complete information on *BELKE Electric Ovens* in Bulletin 1061. Ask your *BELKE Service Engineer*, or write.

Inside dimen.	MODEL		
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WIDE	24"	36"	48"
HIGH	48"	48"	48"
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EVERYTHING FOR PLATING PLANTS

Leonard Thorpe, formerly of *Higgins Rack Coating & Mfg. Co.* of Hazel Park, has opened his own shop for plating and anodizing rack manufacture at 22204 Fenkell, Detroit 19.

The *G. L. Nankervis Co.*, distributors and manufacturers of metal finishing equipment and supplies, announces the appointment of *William Katke* to its sales-engineering staff in the Detroit area.

Prior to joining the Nankervis Co.,



William Katke

Mr. Katke specialized in the design and manufacture of diaphragm systems and associated electroplating equipment.

Born in suburban Detroit, Katke attended Kent State University and the University of Michigan. He is a member of the Detroit branch of the American Electroplaters Society.

Another Stag Day sponsored by the *Detroit Branch* of the *A.E.S.* has gone into the records as the largest such event to date.

On July 19th, at the Forest Lake Country Club, almost 800 members, friends and guests attended the day long function which featured golf, various athletic (?) contests, much elbow bending and small talk, and the steak dinner. In weather that was hot, those present certainly enjoyed all the offerings.

Much credit must be given to those untiring men who gave what must have been a tremendous amount of free time to insure that the event would be successful — *Charley Conley* as General Chairman and his assistants, *Bob Dudley* in charge of Athletic events, *Les Borchert* the highly successful ticket seller, *Carl Durbin* who efficiently handled the procurement and disburse-



Larry Quirk after winning cracker eating contest.

ment of door prizes that went to every one attending, *Fred Wagner* the supplier of entertainment (incidentally, we missed Fred's quiet and unassuming presence) and *Walter Pinner* who acted in an advisory capacity and gave of his vast experience in handling an event of this type.

This event and the December party are the highlights of the branch's social activities and each grows bigger as the years go by. At least at these two functions we see many plating men two times a year. What a branch we would have if only half of these turned up at

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First in Acid Copper

Let DAYBRITE solve your COPPER PLATING problems. Check these important, money-saving items:

- ✓ Low Conversion and Operating Costs
- ✓ High Plating Speed
- ✓ High Degree Of Leveling
- ✓ Smooth, Lustrous Deposits
- ✓ Ideal As Undercoat For Chromium After Color Buff or Brite Dip.

DAYBRITE is time tested and proven. Write now for new technical bulletin giving full details.

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CLEANRITE METAL CLEANERS

Metal Cleaners for all purposes.

Honite Brand—Barrels, Finishing Chips, Compounds, Equipment for the Barrel Burnishing and Deburring Trade.

Specialized Tumbling Engineering Service

Your sample parts processed without cost or obligation, furnish cycle time, cost and materials best suited for your jobs.

Consult our technical service for any assistance you may require in the Plating or Metal Finishing Line.

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Pie Eating Contest



Larry Quirk, the Champ

the monthly business and educational meetings held during the rest of the year.

Much credit must also go to the following list of contributors who did much to insure the quantity and quality of door prizes given out:

Acme Mfg. Co., American Chemical Paint Co., Auto City Plating Co., Automotive Rubber Co., Belke Mfg. Co., Bruce Products Corp., Buckingham Products Co., F. L. & J. C. Codman Co., Detrex Corp., Detroit Chemical Specialties Co., Detroit Plating Indus-

tries, Doehler Jarvis Corp., E. I. du Pont Co., Ecclestone Chemical Co., Frederick Gumm Chemical Co., Hanson-Van Winkle-Munning Co., Harding Mfg. Co., Harshaw Chemical Co., Higgins Rack Coating & Mfg. Co., Howard Plating Industries, Industrial Filter & Pump Mfg. Co., Jackson Buff Co., Knight Plating Co., Lea Mfg. Co., R. C. Mahon Co., Meaker Corp., Metal & Thermit Corp., Michigan Buff Co., Michigan Rust Proof Co., J. C. Miller Co., Murray-Way Corp., McDermid, Inc., McGean Chemical Co., G. L. Nan-

kervis Co., New England Buff Co., Northwest Chemical Co., Osborn Mfg. Co., Parker Rust Proof Co., J. J. Siefen Co., Solventol Chemical Products, Sparkler Mfg. Co., F. B. Stevens Co., Udylyte Corp., United Chromium, Inc., United Platers, Inc., A. T. Wagner Co., Wagner Brothers, Whitfield Chemical Co., Willow Run Rubber & Lining Co., E. J. Woodison Co., Wyandotte Chemical Co., Wyandotte Paint Products Co.

LETTER TO THE EDITOR

Mr. Nathaniel Hall,
Technical Editor, METAL FINISHING,
381 Broadway,
Westwood, New Jersey.
Dear Mr. Hall:

In your shop problems in the July Issue of METAL FINISHING a question is asked regarding the plating of nickel on tin and lead alloy. In my experience the best procedure for plating on these metals is as follows:

- (1) Degrease with trichloroethylene

Simplify your bright zinc plating
with

McKeon's
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TRADE MARK REG'D.

as a constant cleanser and purifier

It will:

1. Precipitate heavy metal impurities.
2. Co-precipitate copper impurities, eliminating need for zinc dust treatment.
3. Minimize need for decanting or filtering.
4. Precipitate excessive carbonates.
5. Reduce Brightener consumption.

Try a 5-gallon can, \$15.00; or a 15-gallon drum,
\$42.75, on 30 days' approval.

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Test these JOB-FITTED gloves for 40% to 70% cost-saving

If your employees have been wearing ordinary canvas, leather or unlined rubber gloves . . .

to handle sharp, abrasive or slippery materials, with or without oil, grease, chemicals, heat or cold . . .

you can probably reduce costs, and improve safety, work handling and employee attitude, by replacing with modern job-fitted gloves of coated fabric.



Reinforced Neoprene (NEOX)
Much tougher and more resistant to chemicals than ordinary neoprene. Many styles.



Natural Rubber
Extremely resistant to cutting. Has firm, non-slip grip—wet or dry. Many styles.



Edmont Plastic
Retains its flexibility, grips well and will not crack or peel. Many styles.

Make This Free Test: Send brief description of your operation, materials handled and temperature condition. We will send samples of the correct job-fitted glove and method for testing on the job. Address

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JOB-FITTED
GLOVES

Edmont Manufacturing Company
1276 Walnut Street, Coshocton, Ohio
World's largest maker of coated industrial gloves

- (2) Soak in mild alkali cleaner
- (3) Scratch brush if necessary
- (4) Cathodic clean in a mild alkali cleaner
- (5) Dip in 10% by vol. of fluoboric acid
- (6) Nickel strike for 10 minutes in a cold ammonium chloride nickel
- (7) Nickel plate to desired thickness in a proprietary bright nickel bath

Very truly yours,
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 H. C. SCHLAUPITZ,
 Research Engr.

OBITUARIES

CHESTER H. FISHER

Chester H. Fisher, 50, secretary and treasurer of Cowles Chemical Company, Cleveland, Ohio, died suddenly July 24 of a heart attack at his home in Brecksville, Ohio. Mr. Fisher came with Cowles in 1929, was elected treasurer in 1943 and secretary in 1952.

His steady influence and great knowledge of financial and accounting matters was of inestimable value to Cowles through the years and he gained the respect and admiration of everyone who worked with him.

He is survived by his wife, Alice, and two children, Joanne and Robert.

LAMMOT DU PONT

Lammot du Pont, former president of E. I. du Pont de Nemours & Company and youngest of the three brothers who led the twentieth century development of the 150-year-old chemical company, died July 24. He was 71 years old and the eighth member of the du Pont family and the third brother in succession to become head of the chemical company founded by Eleuthere Irenee du Pont de Nemours, his great-grandfather, in 1802.

His eldest brother, Pierre S. du Pont, was the company's president from 1915 to 1919, covering a period when du Pont factories supplied 40 per cent of the smokeless powder fired by Allied guns in the first World War.

Irene du Pont, a second brother, succeeded Pierre and was president



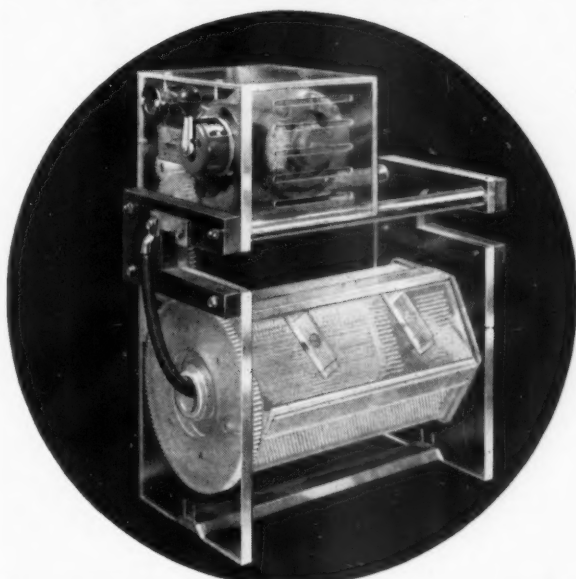
Lammot Du Pont

until 1926. He directed Du Pont's early expansions into rayon, synthetic ammonia, cellophane, dyes and other organic chemicals.

To Lammot du Pont, youngest of the trio, fell the task of rounding out and coordinating what, in little more than a decade, had become one of the most complex communities of chemical manufacturing in the Americas.

Between 1926, when Mr. du Pont

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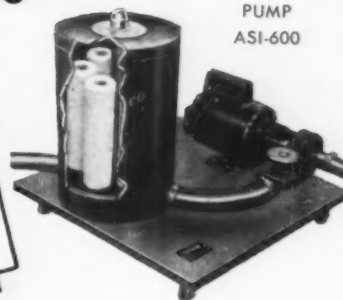
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 Filter Assembly
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 2'x2'x2'



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 H.T. Lucite, #316 stainless, rubber-lined, or Sethrin*
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became president of the company, and May, 1940, when he resigned as president to succeed his brother, Pierre, then 70, as chairman of the board, expenditures for the operation of Du Pont research laboratories were increased almost sevenfold. This unprecedented expansion, effected in the main during general business depression, carried the company far ahead among industrial organizations pioneering in new scientific fields.

Results included such outstanding developments as a man-made rubber compounded from coal, limestone, and salt; the synthesis of nylon; and other research achievements that, in recent years, were accounting for more than 40 per cent of the Du Pont business.

Born October 12, 1880, Mr. du Pont was named for his father, Lamont du Pont, an outstanding authority on industrial explosives. Following his brothers to Massachusetts Institute of Technology, he received his degree in civil engineering in 1901. After work as a draftsman with the Pencoyd Iron Works, he joined the family business in 1902 and rose to general su-

perintendent of the Black Powder Department in 1913.

Upon a reorganization of the company in 1915, he was elected a director and member of the Executive Committee, and the next year was made a vice president. A term as head of the company's miscellaneous manufacturing activities schooled him in Du Pont's expanding interests in plastics, paints, dyes and other chemicals, so that he was well prepared to become the company's chief when Irene du Pont resigned.

Mr. du Pont became a director of General Motors in 1918, serving until 1946, was chairman of that corporation's Board of Directors from 1929 to 1937, and was, for a time, a member of its Finance and Policy Committees. For a number of years, he was prominently identified with the Manufacturing Chemists' Association, which he served as president, the National Association of Manufacturers, the Chamber of Commerce of the United States, and other national bodies representing industry. He was a director of the Wilmington Trust Company.

LOUIS M. FULLER

Louis M. Fuller, 70, president of American Abrasive Co., Westfield, Mass., and prominent industrialist died August 4 in Boston.

Associations and Societies

INSTITUTE OF METAL FINISHING

Electrodepositors' Technical Society

The Council of the *Institute of Metal Finishing* has approved the establishment of the following Medals and Awards. These have been made possible through the generosity and cooperation of three of the Corporate Members of the Institute.

HOTHERSALL MEMORIAL MEDAL AND LECTURE

The Mond Nickel Company, Ltd., have very kindly endowed the annual award of a palladium medal (with which will be associated a sum of

For LOW COST TUMBLING Use the New RAMPE Precision BARREL FINISHER



200 lb. Capacity
With Lined
or Unlined
Barrel . . .

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This sturdy, well designed machine is built for Production Runs of Small Parts or Small Lots of Large Parts.

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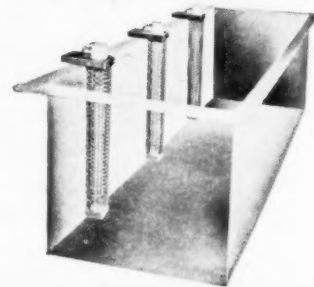
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IMMERSION HEATERS

Here's the immersion heater that overcomes all the problems you've ever had with heating corrosive solutions. Readily adapted to thermostatic control. Light weight, portable, fused quartz body is totally inert to all plating, pickling and electro polishing solutions. Vapor proof electrical connection box. Rugged construction. Long, trouble-free service. Remarkably economical. We will help you engineer special applications.

Write for Bulletin G-13



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£50) for an initial period of seven years. The award will be presented to a person of eminence selected by the Council of the Institute who will be invited to deliver a lecture in memory of the late Mr. A. W. Hothersall to be known as the Hothersall Memorial Lecture.

JOHNSON MATTHEY SILVER MEDAL

Through the generosity of Johnson Matthey & Company, Ltd., a Silver Medal will be awarded annually, or at such times as may be decided by the Council, for the best paper presented to the Institute on the deposition of precious metals.

WESTINGHOUSE BRAKE AND SIGNAL COMPANY, LTD., PRIZE

Finally, the Westinghouse Brake and Signal Company, Ltd., have generously endowed an award for the best publication appearing in the Journal of the Institute which, in the opinion of the Publications Committee, shows the most valuable advance in the science or practice of electrochemistry in general and electrodeposition in particular. The Award will amount to £25 annually and will consist largely of a

selection of books. There is no restriction respecting subject matter within the limits mentioned above; neither is there any restriction respecting age or nationality of candidates for the Award. The Award is to be endowed for a period of seven years in the first place and is then to be subject to renewal or revision.

In the case of the Johnson Matthey Silver Medal and the Westinghouse Brake and Signal Company, Ltd., Prize, both members and non-members of the Institute are equally eligible, and papers should be submitted direct to the offices of the Institute at 32, Great Ormond Street, London, W.C.1.

INDUSTRIAL SAFETY EQUIPMENT ASSN., INC.

The Industrial Safety Equipment Association held their Annual Meeting on June 25, 26 and 27 at The Homestead, Hot Springs, Va. and elected as President *Edison L. Wheeler*, of *Wheeler Protective Apparel, Inc.*

Elected also at the meeting were *S. C. Herbine*, *Willson Products, Inc.*, Vice-President; *J. B. Davies*, *Mine Safety Appliance Co.* and *F. R. Davis*,

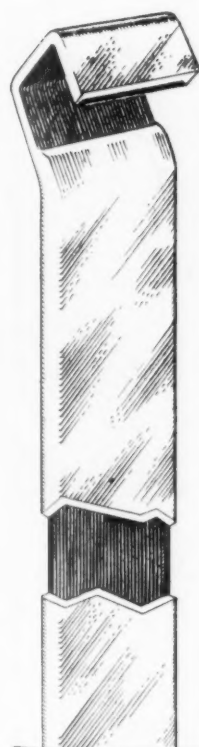
Jr., *Davis Emergency Equipment Co.*, Trustees. *J. A. Brewer*, *Industrial Gloves Company* and *G. M. Glidden*, *Acme Protection Equipment Company* carry over as members of the Board while *Charles H. Galloway*, *American Optical Company*, I.S.E.A. President for the past two years, continues as a member of the Board for another year. In addition, Mr. Galloway has been elected to the Board of Directors of the nation's *National Safety Council*. In this capacity he will serve as liaison between the I.S.E.A. and the Council.

NATIONAL LEAD BURNING ASSOCIATION

N.L.B.A. Will Release Engineering Data

A new program for the preparation and distribution of engineering and technical data on the uses of lead was announced yesterday by the *National Lead Burning Association* following a special meeting of its executive board at the Park Sheraton Hotel.

Members of the National Lead Burning Association are responsible for more than 90 per cent of all new lead construction in both North and



Electro-Cupralum Anodes

FOR CHROME PLATING

A NEW AND REVOLUTIONARY DEVELOPMENT
Electro-Cupralum Anodes are manufactured by combining copper and lead through a Homogeneous Extrusion Process whereby the two metals are chemically and inseparably bonded together.

The resultant product consists of a full width continuous copper electrode with a Homogeneous lead covering on all sides except the underside of the copper hook.

FEATURES

1. Ten times the electrical conductivity of any Lead Anode.
2. Faster, better plating.
3. Even distribution of current through solution.
4. Permanently rigid.
5. Tenacious, insoluble coatings.
6. No build-up of temperature.
7. Periodic cleaning unnecessary.

Electro-Cupralum Anodes are superior because they combine the superior conductivity of copper with the superior protection of lead.

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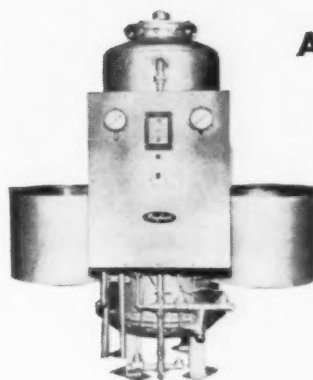
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For Plating Solutions & Hot Water Rinses

COMPLETELY AUTOMATICALLY*



*The new Penfield Mono-Column Demineralizer pictured above performs all its operating functions completely automatically — even recuts in effluent when proper pre-set purity is reached after automatic regeneration. Write for full information on units of any desired capacity up to 10,000 gph.

Operating on the most efficient deionizing technique known (intimately mixed cation and anion exchangers in a single unit tank), raw water passes through a Penfield Automatic Mono-Column Demineralizer only once—yet comes out with resistances reported as high as 20,000,000 ohms. No heat or steam power is ever required and there are no valves to operate. Even regeneration is accomplished completely automatically by the simple flip of a single switch.

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Specially fabricated to suit your individual requirements by Penfield's Tank Fabricating and Lining Division. Write today for complete details.

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FILTERS • SOFTENERS • DEGASIFIERS • DEMINERALIZERS

Penfield "Planned Purity" PAYS!

South America. It has been the practice for contracts between its members and the United Association of Journey-men and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada to be recognized as standard.

The new N.L.B.A. program is designed to complement the L.I.A.'s work by releasing engineering specifications and standards, adaptable to lead construction in the chemical, metallurgical, nuclear, petro-chemical, metal finishing and sulphuric acid industries.

The Association expects that this technical information will be invaluable to American Industry generally, because knowledge of lead burning and construction has been so closely held in the past.

Manufacturers' Literature

Lubrication Process

Detrex Corporation, Dept. MF, Box 501, Detroit 32, Mich.

A new phosphate coating and lubri-

cating process, which makes possible the cold extrusion and forming of steel is fully described and illustrated in an 8-page booklet which is available from this firm. This process, identified as Extrudite, is applicable to both carbon and stainless steels.

New Literature Available

United Chromium, Inc., Dept. MF, 100 East 42nd St., New York 17, N. Y.

This firm has recently made available a new bulletin RC-2, describing the properties and uses of Unichrome Coating 218X, a vinyl plastisol material suitable for coating plating and conveyor racks, degreasing and dipping baskets, plating barrels, drainboards, ductwork, agitators, tank grids, piping, tanks and drums, and other equipment. Copies of this bulletin may be obtained by writing to the above address.

Orlon Work Clothes

Worklon, Inc., Dept. MF, 253 West 28th St., New York, N. Y.

A 16-page catalog featuring many new styles of industrial uniforms made

of the new miracle fabric, Orlon, has just been prepared by the above firm. The book is completely illustrated in color and has full information for all industries on the remarkable acid and chemical resistance of these new uniforms.

Also included in the Worklon catalog are valuable pages of technical data and complete results of tests made by Worklon to prove the importance of these garments to the average industrial worker who is faced with the task of working with chemicals and acids. Copies of the catalog may be obtained simply by writing to the above address.

Wetting Agents

E. F. Houghton & Co., Dept. MF, 303 W. Lehigh Ave., Philadelphia 33, Pa.

Prepared as a guide to speed processing and lower production costs, a new 8-page bulletin, "Surface Active Agents for the Metalworking Industry," has recently been issued by this company.

Based on years of study by Hough-



MORE USEFUL YEARS

STORTSWELDING is protection for your investment in semi-precious metals. It leaves no cracks, crannies or crevices for corrosive agents to lodge and make accelerated attack on vital parts of your equipment. Storts welds it so as to make your material dollars go farther, by lasting longer.



Manufacturers of Welded Fabrications to Specification

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PICKLING TANK TEST in 3 minutes

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**FERRO
PICKLE PILLS**



If you can tell red from green, and count to ten, the job is easy. That's why Ferro Pickle Pills have been standard equipment in the best pickling rooms, for years. They're efficient, economical, and easy to use.

There's a Ferro Pickle Pill for almost every pickle room need; a simple, sure way of determining the solution percentage of sulphuric acid, muriatic acid, alkali and metal-cleaning tanks . . . or the iron content of any of these solutions. One try will convince you. *Write today for literature and prices!*



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ton's research staff, this bulletin lists many metalworking applications where efficiency can be improved and time and costs cut simply by the addition of a very small percentage of a surface active agent.

One page of reports from users lists benefits gained in actual production and contains helpful suggestions for other applications. A chart outlining the physical properties of the leading surface active agents in Houghton's Cerfak and Surfax lines serves to help in selecting the proper product for various needs.

For a free copy write to the above firm.

Metallizing

Metalweld Inc., Dept. MF, 26th & Hunting Park Ave., Philadelphia 29, Pa.

This bulletin, offered by the firm, describes processes and uses; application and how metallizing can be used for making mechanical repairs; protecting surfaces against corrosion contamination. Other Industrial Maintenance Services are briefly outlined.

Conveying Equipment

The Rapids-Standard Company, Inc., Dept. MF, Grand Rapids, Mich.

A newly-revised 28-page catalog of Rapistan conveying equipment with photos, drawings, and specifications of an enlarged line of power and gravity conveyors, hand trucks, and industrial casters has just been published by this firm. Several new equipment models recently announced by the company are shown for the first time in the catalog. This catalog is available by writing to the above address.

Vapor Degreasers

Randall Mfg. Co., Inc., Dept. MF, 801 Edgewater Rd., New York 59, N. Y.

How Ramco vapor degreasing can be adapted to a wide variety of industrial cleaning problems, watch cases to airplane wing sections, and the types of equipment that are best suited to given degreasing needs are given comprehensive definition in an 8-page, illustrated brochure, just released by this firm.

Any manufacturer who is concerned with oil and grease covered work will find many helpful suggestions in this literature. Included are applications affecting small parts that must be handled in mass, or where the grease adheres stubbornly.

The brochure is liberally illustrated with pictorial examples of Ramco degreasing equipment designed for all manner of jobs, with the emphasis on compactness, efficiency and, of course, economy.

Building Up Worn Parts by Electrodeposition

International Nickel Co., Inc., Dept. MF, 67 Wall St., New York 5, N. Y.

Cites the economies of salvaging worn or overmachined parts by plating to build up surface for repair. 12 illustrations and tables. Advantages of using heavy nickel deposits are presented. Review is made of such technical factors as: hardness and strength of deposit, adhesion, stresses and uniformity of deposit thickness. How deposits affect properties of the basis metal (steel) and how to proceed with a repair are described. Advantages of

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nickel plating are contrasted with those of heavy chromium plating.

Guide to Pump Applications

Tuthill Pump Co., Dept. MF, 939 East 95th St., Chicago 19, Ill.

A new type of reference chart on small pump applications has just been developed by Tuthill Pump Company, Chicago.

In one convenient table (letterhead size), this guide lists the various types of Tuthill pumps, the services for which each is built, the performance characteristics, types of packing, styles of mounting, and features that distinguish each model. Thus, selection of the proper pump for the purpose is simplified, it is stated.

Copies of this helpful reference table are available on request to the company at the above address.

Equipment Catalog Highlights Items for Economy & Safety

Red Tiger Products, Inc., Dept. MF, 20 North Wacker Dr., Chicago 6, Ill.

This firm offers a wide variety of products for hard day-to-day use in any kind or size of office, plant, ware-

house, terminal or institution, in its current Catalog 140A. The 16-page booklet contains many pictures and copy for many well known brands of storage, maintenance and light materials handling equipment. Practically every item has prompt delivery.

Red Tiger catalogs select items most in need by firms and institutions to cut time and expense on the job and add safety for workers. All items must qualify under strict quality standards at reasonable prices.

Shipping points on Red Tiger products are to the advantage of users in all 48 states, from standpoints of time and money saved.

Planners and buyers are urged to inquire and make fullest use of Red Tiger's Free Advisory Service on any equipment and materials handling problem by writing to the above address.

Fabricated Fittings

Naylor Pipe Co., Dept. MF, 1230 E. 92nd St., Chicago 19, Ill.

As a practical help in planning piping and equipment layouts, company has announced a new bulletin on standard and special fabricated fittings.

Data includes specifications and prints on standard fittings for lightweight pipe. It also presents illustrations of special fabrications designed to save time and labor and reduce material cost in modernizing piping systems, according to the announcement.

For copies of this Bulletin No. 525, write to the above address.

New Purity Meter Literature

Barnstead, Still & Sterilizer Co., Dept. MF, 129 Lanesville Terrace, Forest Hills, Boston 31, Mass.

The company announces the publication of a new Bulletin, #125, which describes the New Barnstead Purity Meter, an electronic testing device for determining the purity of either distilled or demineralized water.

Operating on the principle that the more impurities in the water, the greater its electrical conductivity, this instrument gives readings directly in parts per million. A conversion table, mounted on the side, shows the equivalent resistance and conductance.

A section of the bulletin is devoted to the Barnstead Conductivity Diverter,

high speed **TIN** anodes

M & T's new High Speed Tin Anodes, for use with either sodium stannate or potassium stannate baths, offer several advantages over pure tin anodes.

1. They can be operated at nearly double the usual current densities without becoming passive.
2. They film at little or no excess current density.
3. The operating film is darker; more easily recognizable.



M & T Anodes, both in Pure Tin and of the High Speed type, are available in slab form with cast-in steel hook.

For additional data, write for the bulletin "Alkaline Tin Plating."

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Specialists in Tin and Tin Chemicals

BRASS PLATING MADE EASIER

If you already know how to maintain your brass solution without rejects or off color deposits don't send for our new bulletin. It's ready to send though to anyone who thinks he can learn something about brass plating as we tell it. A New way to maintain brass solutions to give perfect results every time.

TRUE BRITE Nickel Brightener is still the leader in these days of scarce chemicals. Gives good results all the time. Still available at low prices.

TRUE INSULATORS protect against shorts in your water, steam and air lines. Especially designed for electroplating service. Now available in sizes from 1/8 inch to 1 1/4 inches for immediate delivery.

TRUE BRITE CHEMICAL PRODUCTS CO.

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Oakville, Conn.

Practical Products for Practical People

an automatic control device. Operated by a conductivity cell in the pure water line, this special controller-type Purity Meter will permit only water of predetermined purity to enter the storage tank.

The Barnstead Purity Meter is available with either platinum dipped, glass dip-cell or nickel pointed, hard rubber dip-cell. An attractive carrying case is listed as optional accessory.

Bulletin #125 may be had by writing.

Coatings and Linings

Metalweld, Inc., Dept. MF, 26th & Hunting Park Ave., Philadelphia 29, Pa.

Readers interested in having a copy of a new 12-page Catalog outlining Metalweld's protective coating, rubber lining, metalspraying, welding and sandblasting services for industry, may write to the above address.

Engineering Electroforming

International Nickel Co., Dept. MF, 67 Wall St., New York 5, N. Y.

This booklet contains 6 pages with

7 illustrations and chart. Describes the unique process which places a new tool at the design engineer's disposal and which makes possible the simplification of many construction problems. The three commonly electroformed metals, copper, iron and nickel are compared. How expensive, where and when to use are discussed and typical applications are suggested. Factors affecting production and designing of matrices are presented. It points out practically every plating shop has all the equipment to do electroforming, which may be done on metal, wood, plastics, rubber, wax or plaster to high dimensional accuracy and fine internal surface finish. Obtainable from the above company.

Application of Tin Coating Gage

North American Philips Company, Inc., Dept. MF, 750 South Fulton Ave., Mount Vernon, N. Y.

A new 8-page booklet titled "X-ray Tin Coating Gage" is available gratis from C. J. Woods, Research & Control Instruments Division, of this firm.

Reprinted from a trade publication and written by technologists of a large

steel company, the article explains operating principles and gives complete application details covering a new X-ray instrument used for measuring the thickness of coating on steel plate. The booklet is illustrated with many photos, drawings, graphs and tables.

Copies available by writing to the above address.

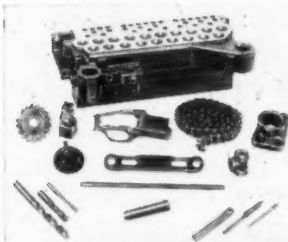
Electric Radiant Panels

Edwin L. Wiegand Co., Dept. MF, 7627 Thomas Blvd., Pittsburgh 8, Pa.

New Chromalox Electric Radiant Panels are described in an illustrated six-page bulletin just published by this company.

The folder explains how this new infra-red generator can be used for paint baking, curing, drying, degreasing and other operations. The panels produce an unvarying radiation in a longer "far-infra-red" wave length that is efficiently absorbed by all colors of material, with negligible reflection even from white surfaces. Built-in essentials like (1) fully-insulated alloy infra-red element, (2) 5-ply thermal insulation (3) continuous 100-ampere

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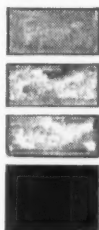
NOT MOTTLED . . .

BUT RICH,

DARK,

UNIFORM

BLACK



WITH *Swift* ACTIVANIUM BLENDED* BLACKENING COMPOUNDS

NU-BLACK—For all irons and steels; silicon and nickel rich alloys. One process for all ferrous alloys. Fast, simple, sure. Peak efficiency over wide temperature range.

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*ACTIVANIUM BLENDED—A method of blending originated by Swift. Not one, but several oxidizers are painstakingly blended to insure maximum density of black oxide finish.

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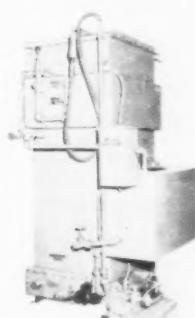
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Model GU24 steam heated. Fabricated of stainless steel. Accessories: vapor level safety thermostat, water economizer, heavy duty spray pump.

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Dayton 3-3900 - 1 - 2



bus, and (4) its own structural steel frame, make it ideally suited to rapid

infra-red oven construction at lowest cost per kilowatt.

Dimensions, ratings, and intensity controls are also listed. Ask the above company for Bulletin CS-605.

Case History Portfolio

Roto-Finish Company, Dept. MF, 3700 Milham Rd., P.O. Box 988, Kalamazoo, Mich.

A collection of editorial articles on the Roto-Finish process which have appeared in leading metalworking journals has just been released by this firm.

The articles show how the process has been applied to specific problems. Included are: three case histories on deburring close fitting, high precision automatic transmission parts; an installation in which 110 different ferrous and non-ferrous stampings, castings, forgings and screw machine parts of all sizes were britehoned or deburred by seven Roto-Finish machines; the facts on elimination of hand filing, brushing, grinding and deburring of automatic washing machine parts; deburring and ball burnishing carburetors, brake and aircraft

parts; and two other descriptive articles giving details on the operation and application of the Roto-Finish equipment and processes.

Any of the articles, or the complete portfolio, can be obtained without charge by writing the above company.

Dust & Fume Control

American Wheelabrator & Equipment Corp., Dept. MF, Mishawaka, Ind.

Vol. 1, No. 1, of "Dust and Fume Topics," a new periodical published by the above company, has recently come off the press. This publication is devoted to news of how Dustube cloth tube-type Dust Collectors are handling various dust and fume control problems throughout industry.

In this first issue, dust handling problems encountered by many manufacturers are discussed. An informative discussion is also presented about recent developments in the design of cloth filter collectors, which make them more adaptable to problems encountered in modern manufacturing plants. All of these items are completely illustrated.

Future editions will present dust

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and fume control data and information applying to other segments of the chemical and metallurgical industries.

Copies of this publication will be mailed upon request. To be placed upon the mailing list, write to the company at the above address.

Practical Methods in Heavy Industrial Nickel Plating

International Nickel Co., Dept. MF,
67 Wall St., New York 5, N. Y.

Outlines the possibility of heavy electro-deposits for the salvage and repair of worn parts, the reclaiming of mismachined parts and for wear and corrosion resistant surfaces on original parts. Heavy Nickel electro-deposits and heavy nickel plus chromium electro-deposits are compared with heavy chromium plate. Preparation of parts, baths and procedure are discussed as well as potential applications.

Volt Ammeter

Columbia Electric Mfg. Co., Dept. MF, 4519 Hamilton Avenue, N.E.,
Cleveland 14, Ohio.

Columbia Volt-Ammeter, a new in-

strument, recently announced to the trade, is a clamp-type, hand size instrument for use on alternating current, that measures up to 600 amperes and 600 volts. It is equipped with ranges of 0-12, 0-60, 0-120 and 0-600 amperes, 0-150 and 0-600 volts. The instrument is easily held and operated with one hand, weighing less than two pounds. Price is \$75.00, complete with voltage leads and carrying case. This folder is available by writing to the company at the above address.

Cleaning Air and Gas Lines

Selas Corporation of America, Dept. MF, Philadelphia 34, Pa.

Two revised bulletins pertaining to equipment for the removal of water, water-oil emulsions and dirt from compressed air and gas lines have just been released. The equipment operates without moving parts, using specially treated ceramic filter candles to clean the air or other gas without significant pressure drop. One series of the equipment covers the range of 10-to-75 c.f.m.; the second series, from 100-to-500 c.f.m. Liquids are ejected continuously and automatically, the filter candles are readily removed for clean-

ing. "Selas Liqui-Jectors." Bulletins SC-1007-1008. Six pages.



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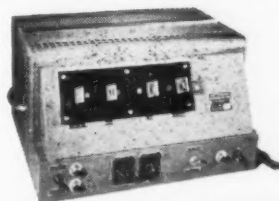
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